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**DISSERTATION**

ON

**INFANTICIDE,**

IN ITS RELATIONS TO

**PHYSIOLOGY AND JURISPRUDENCE.**



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INFIRMARY FOR SICK CHILDREN.

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**1821.**

## ADVERTISEMENT.

*An Index is added to this Dissertation in the present Edition, in conformity with the advice of some Legal Men, who have considered that such an addition would enhance the utility of the work to the members of their profession ; to whose patronage, chiefly, the former one owed the distribution it has obtained, and of which the Author takes the present opportunity for expressing his most grateful acknowledgment.*



TO  
SIR JAMES MACKINTOSH, M.P. L.L.D. F.R.S.

*&c. &c. &c.*

SIR,

I was desirous of inscribing the following attempt to illustrate an important point of Medical Jurisprudence to some name alike eminent in science as distinguished for legal knowledge. I dedicate my book to you, because I know no man to whom a work intended to elucidate any matter connected with science, or legal enquiry, in its detail, could with more propriety be addressed.

The execution of my work, I hope, will not be found so defective as to induce you to repent of the kind permission you have given me to dedicate it to yourself.

I am,

SIR,

With the most profound respect,

Your devoted and most obedient servant,

W. HUTCHINSON.

*London ; Sackville-street,  
June 3d, 1820.*



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## PREFACE.

*IT is the custom in our Courts of Judicature to require the opinions of Medical Men in those causes which rest on evidence deduced from intimate knowledge of the physiology of the human body; and there is no occasion on which men of this profession appear in a more important character, or have more arduous duties to perform. But it must be acknowledged, the instances are not rare in which they have failed to furnish the legal authorities with the information that has, with reason, been expected from them; and where their conduct has favoured the subsequent commission of crimes, by rendering prevalent the notion that vague and indeterminate statements constitute the best evidence that can be produced towards the proof of guilt, in the cases where that proof depends on their decision.*

*The interests of Justice and Good Policy have not solely experienced the evils that have sprung from the source above indicated: an examination in a Court of Law has destroyed the honourable reputation of numerous medical practitioners; and this consequence has not always been so strictly merited as the public have supposed. A man may be well informed respecting the physiology of the human body in the state of health, and with the effects of external agents*

## PREFACE.

*on it, as far as regards the production of the common forms of disease, and yet be unable to reason in a correct manner on the cases of this nature which become the subjects of legal investigation. Many of the facts which here require consideration are not necessarily regarded in the former views, and cannot be known without a deviation from the ordinary course of medical observation and enquiry. Besides this, it is not sufficient that the general laws of Physiology be understood: a knowledge of all the exceptions to those laws that have occurred, or may be supposed likely to occur, is absolutely necessary; as well as the most intimate acquaintance with the character of all the sensible phenomena developed by the human body under every state of health and disease, and of the apparent circumstances from which they have their origin. In a word, a multitude of considerations are requisite, that will almost necessarily escape the attention of persons who have not made the connexions of Physiology with Jurisprudence an especial object of their study.*

*Medical Jurisprudence, however, has not often been cultivated in the way just mentioned; and, until a few years since, when a Chair was appropriated to it in Edinburgh, and taken by DR. DUNCAN, it was entirely neglected in the course of instruction pursued at our Universities. It is not difficult to account for this circumstance. But little knowledge can be acquired respecting this subject, without very extensive researches and much cautious reflection; and it is too completely without the common route of practice, to induce many of those who assume the profession of medicine to devote their attention to it in such a manner. The consequences are, that Physiology in its relations to Jurisprudence, has not been raised to near a level with the other parts of Medical Science; that much precise knowledge of it is confined to a few individuals; and that the only consolation a*

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## PREFACE.

*considerable proportion of Medical Men have in their ignorance of it, is the hope that they may never be consulted on an occasion of this kind.*

*The Author of the following Dissertation has for several years past lost no means, he believes, which his personal exertions or the literature of Europe have presented, for collecting information respecting this subject consonant with the state of Physiology at the present day. He is disposed, however, to defer the publication of the entire results of his labours to a future period, from that part of them relating to MEDICAL POLICE being still far inferior to what he hopes to render it by further attention. In the mean time, he inserted some papers on FETICIDE and INFANTICIDE in the late Numbers of the LONDON MEDICAL AND PHYSICAL JOURNAL; but the plan of that work not admitting of extensive articles of this character, obliged him to confine his observations to a statement of the principal facts, and the more general and important of the judicial inferences. Several points were consequently not discussed, which, it appears, present numerous difficulties to many persons, that might be obviated by more particular considerations. The manner in which those papers have been regarded by Medical Men, has, however, incited the Author to publish the following Dissertation in an isolated form; in which he has entered into a more extensive discussion of the physical and moral relations of Infanticide that appertain to the duties of the Medical Practitioner in jurisprudential investigations.*

*But the instruction of Medical Men has not been his sole object. He has, he hopes, presented such a view of this subject as will render Coroners and Jurymen, as well as Legal Men, intimately acquainted with it; and thus enable them to judge correctly of the abilities of the Medical Practitioner for his duties in the investigation, as well as to correct the errors he may have committed in the judicial infer-*

## PREFACE.

*ences he has formed. The importance of such knowledge will be best discovered by contemplating, in the records of our Courts of Law, the numerous instances where medical evidence betraying the grossest ignorance has not only passed without reprehension, but has even been permitted to influence the voice of Justice, in cases of this kind.*

ON

# INFANTICIDE.

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§ I. THE destruction of the life of a child, either during its birth, or within a few days after it has been born, has so many relations, physical as well as moral, not common to *homicide* in general, that it is entitled to particular consideration as a subject of Medical Jurisprudence. The development of its relations is the object of this Dissertation; and it is to the act above designated that the term *Infanticide* is here applied.\*

APPLICATION  
OF THE TERM.

§ II. On the discovery of the body of an infant, whose death is supposed to have been effected by criminal means, a medical practitioner is usually called to view it before it is removed from the place where it has been found; and he

DISCOVERY  
OF THE BODY  
OF AN  
INFANT.

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\* In a physiological point of view, we should find it convenient to make a distinction between the destruction of the life of a child before, and that committed after, its vital connexion with the mother had ceased; and the acts alluded to might be termed, respectively, *feticide* and *infanticide*: but such a distinction is not acknowledged by the English laws. By our code of jurisprudence, the destruction of the life of a *man*, using the term in its generic sense, is regarded distinctly as it is effected before, and as it is effected after, the commencement of his birth. The former is viewed only as it is a mean for procuring the *abortion* of the subject; and it is this consequence which is assumed as the ground for the attachment of penalty: the latter is properly *homicide*, whatever may have been the duration of life, either before or after the period of birth: though it is convenient, in regard to medical jurisprudence, to contemplate the destruction of life at a certain epoch in a distinct manner; as stated above in the text, and we may be also allowed to designate the act by a peculiar term.

*Conduct of the  
medical practiti-  
oner on this occa-  
sion.*

should, in general, proceed to the spot, to examine it in this situation. But, when it appears, in any particular case, from the account he receives from the messenger, or other intelligent person, who has seen it, that it is probable it may not be absolutely dead, and it lies in a situation deleterious to its life, he should order it to be removed thence, and carried to the nearest convenient place, more favourable and proper for its preservation, provided this can be done before he may himself be able to arrive at the spot.

If he proceed to the place in which it has been discovered, he will notice, in the first instance, the nature of the local situation, especially whether it be water or land, hot or cold ; if there be present any thing calculated to promote or retard the putrefaction of animal bodies ; and if the air surrounding it be apparently fit for respiration : the attitude of the body, the things adjacent to it, especially such as may have been instruments of violence, should be then regarded ; if blood, or other animal matters, be collected about it, he will consider whether or not it appears that they have issued from the body. When the place is retired or remote from habitations, he will remark any particular traces of human steps on the surface of the ground about it, and the distance from any public roads. Should it have been removed from the place in which it was found, he will endeavour to obtain the same information from the persons who discovered it ; and he will afterwards, if possible, himself examine the spot.

He will then examine whether the infant be alive or dead, in order that, should the former appear to be the case, the best means in his power for its preservation may be immediately employed, at the same time that he is having it removed to a more proper place, should it be in a situation unfavourable to the object of his exertions. He will also remark its sex, and general external appearances ; and, if it be clothed, whether it is so in the usual way of such an infant, or only enveloped in some common garment. From this time until his final examination of it, he should not suffer it to be out of either his own presence, or that of known persons, whose due care of it, and whose testimony, may be relied on.

Whenever sensible proofs of absolute death are not present, the body should be subjected to the means best calculated to excite it to vigorous life : these are, external warmth and gentle friction over the surface of the body, especially about the chest and arm-pits, whipping the soles of the feet with small rods ; the application of alcohol, or some other analogous stimulating substance, to the nostrils ; the injection of a small quantity of such substances into the rectum ; electricity, or galvanism ; and, especially, inflation of the lungs with air.\*

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\* It seems necessary to describe here the manner in which this inflation of the lungs should be effected, as it has often been attempted without success, even by medical practitioners.

If the mouth or nostrils of a new-born child be blown into, without the use of some previous measures, the stomach is more likely to become inflated than the lungs. In order to secure success in this operation, the external orifices of the nostrils should be closed by the fingers of an assistant ; the practitioner should grasp the upper part of the wind-pipe, not so forcibly as to compress it much, just about the thyroid and cricoid cartilages, (that is, at the protuberance vulgarly called *Adam's apple*,) with his thumb and fore-finger, and gently thrust it *backwards* and a *little upwards* ; he will

When it appears that the body is dead, information of the circumstance should be given to the constable, or superintendant of the parochial police, and the Medical Practitioner must not dissect the body for any purpose, unless he receive an order to that effect from the Coroner. It is under the inquisition of the Jury, too, that he will be required to execute this examination.

§ III. The foregoing remarks apply especially to a body that has been discovered in a retired place, and which is supposed to have died from criminal means ; but it may happen that similar conjectures may apply to one that has been, from the time of its birth, constantly in the presence of known persons. In this case, the Medical Practitioner will enquire whether or not it

CASE IN  
WHICH THE  
INFANT HAS  
NOT BEEN  
CONCEALED.

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thus close the canal of the œsophagus, and consequently prevent the air passing into the stomach. The tongue is then to be drawn forwards between the lips on one side of the mouth; a tube of any kind, (a portion of a quill, a piece of a tobacco-pipe, or a roll of paper, in want of better means,) is to be passed into the mouth half an inch beyond the gums, on the other side, the lips closed all round it, and a stream of air blown through the tube (the air may be furnished by the mouth of a person, but he should fill his mouth with the requisite air without drawing it down into his lungs; he may thus fill the lungs of the child with nearly *pure* air), with as much force as he can exert with the muscles of his cheeks. This insufflation is to be made repeatedly; at each time he may propel all the air he can contain in his mouth: a slight compression of the chest should be made after each insufflation, and of the belly too if it be distended by it. This measure is to be employed at the same time with the other restorative means, and should be continued for at least one hour; and then resorted to after an interval of half an hour, (during which time the use of the other means is to be continued,) and persevered in for half an hour longer. Hope of their success after this period cannot be rationally entertained.

In the foregoing remarks, I have had in view the instruction of the public in the means proper for *restoring suspended animation*, as cases may occur in which it is desirable that they should be employed without delay, when the attendance of a Medical Practitioner cannot be quickly obtained: but, I urgently advise the latter to make an opening into the trachea, instead of blowing into the mouth, in all cases where he is not satisfied, by the elevation of the ribs, that the lungs are really inflated by the latter method: as the glottis of new-born infants is sometimes closed by a viscid mass of mucus, which forms an obstacle that cannot be removed by blowing into the mouth.

In the case of resuscitation of the child, the danger of ill consequences from the operation here advised is almost a nullity; it is certainly not worthy of comparison to the advantages that may be derived from it in certain cases; nor to the danger arising from the injury caused by passing an instrument within the glottis.

had shown signs of life ; and, if it had evinced them, what were the circumstances relating to it previous to its death, especially if it had cried, taken food, and voided its urine and feces ; and the length of time it has been dead. He will question respecting the mother : whether this was her first child ; if her labour had been natural, easy, or difficult, and if it had presented any extraordinary circumstances ; what medical aid had been resorted to ; what was the state of her health before and after parturition, especially whether she had suffered hemorrhage ; and what persons were present at her delivery. His conduct in regard to the body will not vary essentially from that designated in the preceding section.

§ IV. There is no occasion where the Medical Practitioner should feel more deeply sensible of the importance and difficulty of the functions imposed on him, than when he is required, by legal authority, to form a judgment on the nature and cause of death in a case of supposed infanticide. As his observations, and the inferences he forms from them, will always have very considerable influence on the jury, and often peremptorily direct their verdict, he should himself be calm amidst the trouble and agitation which surround him, and deaf to popular clamour and the vague reasonings and conjectures which the vulgar are always readily disposed to intrude on his attention. He should contemplate nothing but his

GENERAL  
CONDUCT OF  
A MEDICAL  
PRACTITION-  
ER IN AN EN-  
QUIRY RE-  
SPECTING IN-  
FANTICIDE.

object, examine it attentively in all its relations, and permit nothing to distract him from the train of his researches. However attentive he may be to his investigation, he should never confide entirely to his memory ; but take down in writing a concise and clear account of his observations ; and, in case of wounds or similar injuries being present on the body, it is advisable for him to trace in outline a design of them.

OBJECTS OF  
THE ENQUIRY.

§ V. The objects of this enquiry are to determine : 1. Whether the infant was born dead or living. 2. If it was born dead ; whether it died some time before, or during, parturition. 3. If it is proved to have lived after its birth ; whether or not its death should be imputed to natural and unavoidable causes, wilful destructive violence, or omission of proper care. 4. In case of its death having arisen from want of due care ; whether or not criminal negligence was the cause of it, especially on the part of the mother, in the case of her giving birth to the child whilst alone. 5. The degree of probability, that any woman supposed to be the mother of the child really bears such a relation to it.

ANATOMICAL  
EXAMINATION OF THE  
BODY.

*External appearance.*

§ VI. Having received legal authority to proceed to anatomical examination of the body, he should notice the external appearances before he begins to dissect any part of it ; and it will be

proper for him to investigate them in the following order. First, whether any natural physical obstacles to the vitality of the subject appear to have existed; as, want of the head, brain, heart, lungs, and alimentary canal. Then, the apparent term of its intra-uterine or fetal life; but, in order to determine this, it is necessary for him to possess accurate knowledge of the gradual development of the fetus, and its characteristics at different epochs, from the time of its first formation. This obliges me to make a digression, for the purpose of adducing the information here required.

From the time of the first evidence of impregnation to the fifteenth day, the product of conception appears only as a gelatinous, semi-transparent, flocculent mass, of a greyish colour, liquifying promptly, and presenting no distinct formation, even by the aid of the microscope. At thirty days, it has the size of a large ant, according to Aristotle. In a few days more, it acquires the bulk of a barley-corn, as Burton states; or, according to others, of a common fly; Baudelocque says, only of that of the malleus of the tympanum: its length is at most from three to four lines, or somewhat less than the third of an inch. At forty-five days, its length is about ten lines, and the form and lineaments of the principal organs, and the place from which the limbs are to arise, may be discerned. At sixty days, all the parts are perfectly distinct: its

*Digression respecting the development of the fetus.*

*Development of  
the fetus.*

length is then about two inches. During the third month, the organization becomes more perfected; the features of the face become more distinct; the brain, the spinal marrow, and the blood-vessels, may be seen through the integuments; the hands are closed, and the fingers are, proportionally, very long; the genitals are evident; the penis and clitoris are relatively very large; the nymphæ are projecting, and the labiæ very thick. In the fourteenth or fifteenth week after conception, all the external parts may be perfectly distinguished, with the exception of the hair and nails. The fetus nearly fills the cavity of the uterus; the great relative proportion of the fluid of the membranes having disappeared. The head now descends towards the orifice of the uterus. About the end of the fifth month, the motions of the fetus begin to become sensible to the mother. At this time, too, we begin to find some traces of fat under the integuments, where previously nothing but a sort of gelatine had been discerned: the ordinary length of the whole fetus is about ten inches. The head had hitherto been very large in relation to the body; but, in the course of the sixth month, the proportions seen in the infant become more nearly established. It is now, however, large and soft; the fontanelles are much expanded; the skin is very fine, thin, pliant, and of a purple colour, especially in the palms of the hands, the soles of the feet, the face, the lips, the ears, and the breasts. In males, the scrotum is of a bright-red

colour; in females, the vulva is projecting, and the labiæ separated by the protuberance of the clitoris. The hair on the head is very thinly dispersed, short, and of a white or silvery colour. The eye-lids are closed; the hair on the eye-brows and the eye-lashes but thinly scattered: the pupil is, ordinarily, closed by a membrane; the nails are wanting, or scarcely apparent. In this month, too, the internal organs undergo a remarkable development: before this time the brain was but a soft mass, equally white throughout its whole extent; it now presents a plane uniform surface; but its consistence is so slight, that it dissolves on being touched by the finger: the pia-mater seems only to lie over its surface, being separated with the greatest facility. The lungs are very small; the heart voluminous, but its ventricles are not very distinct from the auricles; the liver, very large, is situate near to the umbilicus; the gall-bladder contains only a small quantity of a nearly-colourless serous fluid; the meconium is small in quantity, and is found only in the coecum and a small portion of the colon. In the male, the testicles are found a little below the loins, near the lumbar vertebræ: in the female, the ovaries are small, elongated, very distinct from the uterus, and situate near the same vertebræ. The ordinary length is from thirteen to fourteen inches. In the course of the seventh month, when the vitality of the fetus much increases, all the parts acquire more firmness: the skin assumes a roseate tint; the sebaceous follicles

*Development of  
the fetus.*

*Development of  
the fetus.*

interspersed about it, begin to secrete a fluid which is extended over its surface, so as to form a whitish, unctuous, covering. The eye-lids are no longer agglutinated; the pupillary membrane disappears; or, properly speaking, it divides in the middle, so as to form the pupil. The hair on the head is longer, takes a deeper hue; the nails acquire more firmness. The length is about sixteen inches. In the eighth month, the skin has more density, and a more clear tint; it is covered with very fine short hairs, and its sebaceous coating becomes more apparent; the nails are more firm; the hair of the head is longer; the breasts are often projecting, and a lactiform fluid may be pressed from them: in males, the testicles are frequently engaged in the abdominal ring. The cerebral substance has acquired more consistence; its interior is of a reddish colour, its surface is still white; the pia-mater becomes more adherent to it, and some of those grooves and undulations may now be perceived which afterwards constitute the circumvolutions: those grooves are, however, very superficial; but they become more strongly impressed as the fetus approaches to maturity. The spinal marrow, as well as the pons varolii and medulla oblongata, acquire a remarkable consistence, and even firmness. The lungs are of a reddish colour; all the parts of the heart are more distinct; the liver preserves nearly its former relative size, but it is more remote from the navel; the fluid in the gall-bladder is of a yellowish colour, and has a

bitter taste ; the meconium is more abundant, and fills the greatest part of the large intestine. The length is about eighteen inches. At the ninth month, all the parts have acquired more consistence : the head is large, but it has a considerable degree of firmness ; the bones of the cranium, although movable, touch each other at their margins ; the fontanelles are less large ; the hair is longer, thicker, and of a deeper colour ; the sebaceous covering of the skin is more adherent, and the hair on the part is more apparent. In the male, the testicles have often passed the pubal ring, or are even in the scrotum ; the nails are firmer, and prolonged to the extremity of the finger. At the termination of this month, the circumvolutions are more numerous on the surface of the brain ; the parts afterwards termed the cineritious portions begin to be distinguished by their colour ; the firmness of the medulla oblongata and spinal marrow is increased ; the cerebellum, as well as all the basis of the cerebrum, especially the points of it corresponding to the nerves, have acquired a very remarkable consistence ; whilst the mass of the lobes of the cerebrum, and all their convex surfaces, preserve much of their former softness and flexibility. The ordinary longitudinal diameter of the head, that is, from the forehead to the occiput, is from four inches to four inches and a half ; and the transversal, about three inches and a half or four inches. The lungs have now become redder and more voluminous ; the branch of the pulmonary

*Development of  
the fetus.*

*Development of  
the fetus.*

artery communicating with the aorta, termed the *canalis arteriosus*, has a considerable capacity ; it is nearly an inch in length, and its parietes are more thick and dense than formerly. The foramen ovale in the septum of the auricles of the heart, is also very large ; but the valve which is to close it after birth, has acquired more firmness and more extent than at an earlier period : the liver has also more consistence, the bile is more bitter ; the meconium fills nearly the whole of the large intestine ; the bladder contains urine ; and, finally, every thing announces that the organs are qualified for the performance of the functions necessary after birth.

To the above account it may be useful to add some observations respecting the formation of the skeleton, (which are deduced from the researches of M. BECLARD :) as this proceeds according to more regular laws, and is more palpable to the senses than the structure of the softer parts, it may furnish important evidence, when the appearances of the latter will only admit of doubtful inferences ; because diversities in this respect will exist from varieties in the age and constitution of the mother, and from other circumstances affecting especially the fetus itself. The account above given, can therefore be considered only as of general application.

After two months have elapsed from the period of conception, the skeleton is about 4 inches

and 3 lines in length; that of the spine being 2 inches. At three months, the former is 6 inches, and the proportion of the spine as  $2\frac{2}{3}$  to 6. At four months and a half, it is 9 inches, and the spine 4; at six months, 12 inches, the spine 5; at  $7\frac{1}{2}$  months, 15 inches, the spine  $6\frac{1}{3}$ ; at nine months, or the period of birth, it is ordinarily from 16 to 20 inches in length, or, at a medium, 18; and the spine is in the proportion of  $7\frac{3}{4}$  to 18 to the whole length of the body. These calculations were made from observations on about fifty fetuses, at each of the periods above indicated.

*Development of  
the fetus.*

Each vertebra, consisting originally of a section of a solid cylinder, and a ring furnished with several apophyses, is, in general, formed by three primitive points of ossification: the one anterior, which, by its development, forms the body or solid part of the bone; and two lateral ones, which constitute the apophysarial masses; and which, uniting together and with the former, constitute the annular structure. Besides these, each vertebra is completed by several secondary points of osseous development.

At about the sixth month of intra-uterine life, two points of ossification are found in the second cervical vertebra, one situated above the other. Towards the seventh month, the superior point, which answers to the odontoid process, is larger than the inferior, which relates to the body of the bone. At about the eighth month, the trans-

*Development of  
the fetus.*

verse processes have begun to ossify in the first of the lumbar vertebræ. At the time of birth, ossification has commenced in the body of the first cervical vertebra, and also in the first bone of the coccyx. At this age, the body of the fourth lumbar vertebra, which is the most voluminous, is three lines in depth and six lines in breadth. At the same period, the lateral portions of the six superior dorsal vertebræ begin to unite together, so as to form a ring posteriorly to the bodies of those bones. The lateral arch of the second, which is the largest, forms a chord of seven or eight lines.

The weight of the fetus at the full term of utero-gestation has generally been rated too high; apparently from this having been stated from conjecture, rather than from the evidence of the balance. It appears, from the observations of Dr. HUNTER,\* made at the British Lying-in Hospital, on the bodies of several thousand newborn and perfect children, that the weight of the smallest was about four pounds, and the largest eleven pounds two ounces; that of by far the greater proportion was from five to eight pounds. Dr. CLARKE's enquiries furnished nearly similar results: he found that the average weight of male children was seven pounds five ounces and seven drachms; and that of female, six pounds eleven ounces and six drachms.†

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\* *Anatomical Description of the Gravid Uterus.*

† *Philosophical Transactions*, vol. lxxiv.

Dr. CLARK, of Dublin, found it vary from four to eleven pounds. Dr. MERRIMAN states, in his Lectures, that he delivered one which weighed fourteen pounds (it was born dead); and Dr. CROFT delivered one alive weighing fifteen pounds. It is, it appears, somewhat less in France than in England: of fifteen hundred and forty-one examined by CAMUS, under circumstances similar to the foregoing, the greatest weight was nine pounds, and of this there were sixteen instances; the ordinary, from five to seven; and the average, six pounds and about a quarter; there were thirty-one instances in which it was as low as three pounds, though BAUDELOCQUE\* states that he saw several instances in which the weight was about ten pounds, a few where it was twelve, and one of thirteen. Subsequent observations on twenty thousand children at the Hospice de la Maternité, at Paris, have shown a few instances where it has been one hundred and sixty-eight ounces, that is, ten pounds and a half, which has been the highest term. In Germany, it appears to be nearly the same as in France; for ROEDERER states the average weight to be from five pounds to six pounds and a half.

*Development of  
the fetus.*

The length of the fetus at the full term varies much less than its weight: it is ordinarily from nineteen to twenty-two inches; seventeen, and twenty-six inches, will include the two extremes: excepting, perhaps, some very rare cases.

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\* *Art des Accouchements*, tom. i. p. 220.

*To weigh and  
measure the body.*

On returning from this digression, I should remark, that it is only the external characteristics of the age of the child, and its conformation, that can be viewed at this stage of the inquiry; but the application of the preceding observations should be borne in mind in its further prosecution. The body should now be weighed, and the result noted, because some important inferences may be drawn from this, which will be hereafter disclosed. Its dimensions, with respect to length, should also be ascertained.

*Putrefaction of  
the body.*

The degree of that decomposition of animal bodies which commences immediately after death, should next be remarked; and we here suppose it not to have proceeded to such a state of putrefaction as would destroy the cohesion of the soft parts, and render them an indistinct pultaceous mass. In such a case, and when putrefaction has made considerable progress, the Medical Practitioner must conform to the directions comprised in this dissertation to the utmost of his abilities; but he may be unable to put many of them in practice in any way.

*Conversion of the  
body into adi-  
pocire.*

When an animal body has lain in water for some time after its death, it becomes, under certain circumstances, converted into a matter nearly resembling *spermaceti*, which is called *adipocire*. This conversion takes place most readily, in a single body, in a running stream. But, it appears from the experiments of Dr.

GIBBES,\* that five or six weeks must elapse before it is effected, to any great extent, under these circumstances. In a few rare cases, LECIEUX states, from his observations at the Hospice de la Maternité at Paris, the body of a fetus which has died in the uterus, and been retained in it for a considerable period after its death, has been partially converted into a similar matter. This leads me to designate the general external appearances of a fetus that has been retained in the uterus after its death, which I take from the author just mentioned; and these considerations may become of great importance in regard to the object of this inquiry. The ordinary period which it remains in the uterus in this state, is from five to twenty days; and, according to the greater or less length of it, the body will have lost more or less of its consistence and firmness: the limbs become lax, and the muscles readily torn; the epidermis may be removed by the slightest friction; the skin assumes a purplish or brownish-red colour; there is often some bloody serum effused in the cellular tissue, just beneath the skin, especially about the cranium; there is sometimes a similar effusion in the cavities of the chest and abdomen, and the viscera in these cavities are of a deep reddish hue; the interior of the vessels presents the same colour; the umbilical cord is large in circumference, soft, infiltrated with

*Appearances of  
a fetus that has  
been retained  
in the uterus  
after its death.*

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\* *Philosophical Transactions*, 1794 and 1795.

serum, livid, and is very easily torn; the thorax is flattened, the head falls into different shapes, and becomes flattened from its own weight; the membranes uniting the several bones of the cranium are much relaxed, sometimes the bones are disunited; the brain is in almost a fluid state, and emits a fetid odour.

*Whether the placenta be attached to it.*

The next thing to be noticed is, whether or not the placenta be attached to it.

*Signs of wounds and contusions.*

After washing the body, if it be dirty or bloody, (having previously examined whether or not it be covered with the sebaceous matter usually present on the skin of newly-born infants,) and shaving the hair off the head, the appearance of it should be particularly examined, with the view of ascertaining whether there are signs of wounds, contusions, or excoriations. It should not be forgotten, that there are always on the surface of dead bodies, especially on that side on which it has lain after death, superficial livid marks, arising from stagnation of blood in the small vessels of the skin. As the people are apt to regard these as signs of violence, and such propositions have been made in courts of judicature, it is proper, in order to prevent litigation on this point, to remove a layer of the skin where this lividness is present, to show that it is confined to this organ, and is not attended with infiltration of blood in the cellular tissue.

The form and disposition of the limbs should be examined, so as to ascertain whether or not there be fracture of any of the bones, or dislocation of the joints.

*Fractures of the bones, &c.*

After this general survey, the head, eyes, cavity of the ears, neck, superficies of the spinal column, thorax, arm-pits, and all the canals entering into the interior of the body, should be more particularly and minutely examined, because infants have been destroyed by slender instruments thrust into vital organs through several of those parts. In such cases there will be a spot of ecchymosis, which will point out the wound, which should be traced first by a probe, and then by dissection, with as little injury as possible to the surrounding parts. Luxation of the vertebræ of the neck, and signs of twisting of them, should be examined, with the view to ascertain whether they were effected before or after death; or whether, in case of the head being the part last retained in the uterus, they have arisen as a consequence of this circumstance. The signs by which this may be known to have happened will be presently described, as well those which indicate that certain marks about the part under consideration may be considered to have arisen from violence during life.

*Inspection of the parts adjacent to vital organs.*

The species of criminal violence, by which newly-born infants are commonly destroyed, are, wounds, contusions, and strangulation.

*Wounds, contusions, and strangulation, the usual means of destruction.*

*Wounds.* The description of wounds need not be here adduced ; though it may be proper to state, that the term is used to signify a solution of continuity of the soft parts of the body in which the skin is engaged.

*Contusions.* Contusions are always accompanied with ecchymosis, which consists in lesion of the more minute blood-vessels, and with extravasation of blood and its infiltration and accumulation in the cavities of the cellular tissue. Ecchymosis may accompany wounds, or exist alone ; or it may attend various degrees of laceration of the parts situate beneath the skin.

The nature and course of these species of injury should be accurately examined ; and all the lesions of important organs carefully noticed. It will be proper, however, to take cognizance of some more external appearances before they are traced into the great cavities of the body.

When wounds and ecchymoses are present, it is of the highest importance that it should be known whether they were produced by external violence during life, or after death.

*Characters of  
wounds made  
during life.*

Wounds made during life, present red and bloody surfaces, with ecchymosis ; and, when death has not instantly followed their infliction, their edges will be somewhat tumid and retracted, and the surrounding skin of a reddish

hue. It is probable, too, that clots of coagulated blood may exist in them, and these will be found to adhere to their surfaces. When several days have elapsed, they are generally bedewed with purulent matter.

Wounds made when the circulation of the blood has ceased, and the body has become cold, and when the blood has coagulated in the vessels, and the muscles have become rigid; may be known to have taken place after death by the surfaces of them being pale and without tumefaction or retraction; they contain no adherent clots of blood, and there is no surrounding ecchymosis. These characters may not be so distinct when they have been effected soon after death, when the body is yet warm, the blood fluid, and the muscles still retain some degree of contractility; yet, in this case, there will be neither tumefaction of their edges nor ecchymosis, and the blood which may have oozed from the divided surfaces will remain fluid, or form clots not adherent to them.

*Characters of  
wounds made  
after death.*

Contusions effected during life are always accompanied with more or less of ecchymosis; and, when they have been produced by severe external violence, the skin is always engaged in the lesion: this lesion of the skin may be either merely ecchymosis in its own texture, or more or less laceration of it.

*Characters of  
contusions made  
during life.*

When ecchymosis is superficial, and the subject outlives its production, the part presents a spot of a red or bluish colour; this spot, which is formed by the blood infiltrated into the cellular tissue, soon assumes a deep livid or leaden hue; it then, after a few days, becomes, successively, violet, yellowish, and terminates by a pale citron colour. It is seven or eight days, generally, before it disappears. The circumference of the spot is always of a less deep hue than the centre. There is commonly, too, some degree of elevation of the skin corresponding to them. When they have been produced by any thing grasping or twining about the part, there is usually some degree of folding or puckering of the skin.

*Characters of  
contusions ef-  
fected after  
death.*

The above characters will clearly distinguish contusions made during life from those occurring after death; the latter, which, for the sake of distinction, might be termed *bruises*, are of a deep or purplish brown colour, attended with no diffused infiltration of blood in the cellular tissue surrounding the spot precisely injured; and there is no elevation of the skin corresponding to them. The skin may lie in loose large folds over them, but it is not puckered up in small wrinkles, requiring some continued effort to remove them, as it often is in contusions effected during life. There is commonly no coagulated blood lying without the vessels; but this circumstance will be regulated precisely by the same causes as

those which relate to the existence of blood in wounds.

In order to discover the nature of the two last appearances, it is necessary to dissect the part very carefully; and it is only when this has been done, that a judgment can be formed whether or not wounds and contusions were qualified to destroy the life of the subject,

There are some spontaneous changes in the appearance of dead bodies, which it will require some attention to distinguish from those just designated. The first is, the lividity of some parts of the surface, described on a former occasion, when the means by which it might be recognized were shown. But, when putrefaction has made a certain progress; when the soft parts have lost much of their consistence, and the blood has regained its fluidity; this liquid oozes out from the vessels which contain it, and forms soft fluctuating tumors beneath the skin; which, on being opened, are found to contain a blackish, bloody fluid. These tumors appear, principally, in the most dependant parts of the body, and in those formed chiefly of loose cellular tissue, in the scrotum and the eye-lids. The fetid state of the body, the nature of the fluid, and the other signs of putrefaction, will indicate their nature.

*Various spontaneous changes in dead bodies.*

In regard to the inferences drawn from the presence of ecchymosis, it should be borne in

*Restrictions of the inferences from the presence of contusions, fractures, &c.*

mind, that the child may suffer such a degree of pressure, and other violence, during parturition, that there will be found in different parts of its body, after its birth, ecchymoses, tumefactions, fractures of the bones, and luxations of the joints.

*Origin and characters of the contusions occurring during the birth.*

The part of the infant which presents at the birth, has to encounter a greater or less degree of resistance in passing through the orifice of the uterus, the pelvis, and the orifice of the vagina; and, according to the degree of this resistance, the nature, frequency, and duration of the uterine contractions, the part of the infant which presents is more or less compressed and squeezed, and, consequently, the circulation of the part is more or less deranged, and tumefaction, redness, and lividity of it, will thence result. There may be some degree of ecchymosis present, when rupture of blood-vessels has been produced. These effects are generally greatest in very young women, and in the first parturition. When the head has presented, it is commonly at the hind-part of it that the tumefaction is observed; when this is dissected, more or less serous effusion is found, and a congestion of blood in the vessels to an extent which does not exist in other parts of the head. When the labour has been long and difficult, especially if the head be unusually large, and has been pressed for a considerable time against the mouth of the uterus by violent uterine contractions, a tumor of considerable size will often be formed, and sanguineous serum effused

in the adjacent cellular tissue: sometimes the pericranium is even detached from the skull, and coagula of blood are found beneath it. The membranes uniting the sutures in this part may be elongated, and even lacerated; and, consequently, the bones thus united, will be more easily and freely movable than in the ordinary state. When there is deformity of the pelvis of the mother, especially if it consist in a projection forward of the lower part of the lumbar vertebræ, there may exist, as a consequence of it, depression, and even fracture, of some one or more of the bones of the skull, which are commonly the parietal bones. When the breech has presented, there may be similar appearances of the skin and cellular tissue in this part; whilst the scalp, on dissection, shows spots of ecchymosis of a reddish colour dispersed about it, either above or beneath the pericranium. This is commonly found where infants have been turned, and delivered by the feet.\*

A woman suffering labour alone may have the fetus escape from her, and fall to the ground on its head, whilst she is resting on her knees and elbows, or standing on her feet. Some experiments were therefore made at the *Hospice de la Maternité* at Paris, to ascertain what the effects on the head of the infant would generally be from

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\* Lecieux, *Considerations sur l'Infanticide*, p. 25; Hesselbach, *Vollst. anl. zu Gesetzmässigen Leichenöffn.*; Buttner, *vom Kindermord*, p. 152. *Vorles ueber gerichtl. Arzneyk.* Band. ii, 2. s. 9.

such accidents. LECIEUX relates, that fifteen infants were chosen who died a short time after their birth, in whom no deviation from the ordinary state in the bones of the skull could be discerned. They were raised up by the feet to such a height that the surface of the sinciput was about twenty inches (English measure) from the ground, when they were let fall perpendicularly on a stone floor. A longitudinal or angular fracture of one, and in some instances of both, parietal bones, was found in twelve of them. Fifteen infants were let fall in the same manner from twice the height above mentioned; and dissection showed in twelve of them fracture of the parietal bones, which in some extended to the os frontis. When an infant was let fall from a greater height, the membranous commissures of the cranium were stretched, and even torn in some places, the form of the brain often altered, and, in some cases, there was extravasation of blood above or beneath the dura-mater, or in that membrane itself; and it was only when the cranium was unusually soft and flexible, that fracture was not found. Fracture of the bones of the limbs, and dislocations of the joints, occur only in cases where some other part than the head has presented at the birth, and when some artificial efforts have been used, the signs of which may generally be discovered on the body by ecchymosis, &c. and information on this point may sometimes be obtained from the mother, or from other persons present at the labour.

Evidences of signs of suffocation should always be sought after: those presented by the body externally, are, redness or lividness, with tumefaction of the face, prominence and redness of the eyes, projection of the tongue from the mouth, and a frothy mucus oozing from this part; and, when they exist, it is necessary to examine with especial care, whether there are marks on the body, externally, of means capable of producing suffocation; because asphyxia, caused by the viscid mucus naturally existing about the pharynx and glottis in newly-born infants getting into the trachea, *especially if the infant has lain on its back for some time after its delivery*,\* convulsive cough, and irregular action of the respiratory organs, may present, internally, similar appearances to those observed after suffocation from deprivation of air in any way: though there are some peculiarities when this arises from drowning, or respiration of noxious gases, which will be presently described. Unless, then, signs of criminal violence on the body externally exist, it will not be possible, except in the latter instances, to affirm that suffocation has been wilfully produced.†

The livid circle round the neck, which, with-

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\* Buttner, *vom Kindermord*, p. 197.

† "When a child's head or face looks swoln, (says Dr. Hunter,) and is very red, or black, the vulgar, because hanged people look so, are apt to conclude that it must have been strangled. But those who are in the practice of midwifery know that nothing is more common in natural births; and that the swelling and deep colour go gradually off, if the child lives but a few days. This appearance is particularly observable in those cases where the navel-string happens to gird the child's neck, and where its head happens to be born some time before its body."—*On the Uncertainty of the Signs of Murder in the Case of Bastard Children*.

out due consideration, might seem to be a proof of the application of criminal violence, will, on proper reflection, appear to be capable of being produced by rigid and forcible contraction of the orifice of the uterus, or from the navel-string being twisted round the neck of the infant, which may have suffocated it.

It is possible, that the navel-string may be twisted round the neck of the infant, but loosely, until the body is nearly expelled; and then, if the placenta be firmly retained in the uterus, it may become tightened, and cause suffocation. These circumstances may happen when there is no person about the woman to render her proper assistance; and therefore, careful examination is necessary, in order to ascertain, if, with the livid circle round the neck, there are marks of nails or points of fingers, or excoriation of the skin. The breadth of the mark, too, and whether or not it makes a complete circle, with the ends exactly meeting, and without deviating from this circle, should be noticed: the latter circumstances conjoined cannot arise from a natural twisting of the navel-string. The livid part should be carefully dissected, in order to ascertain if there are ruptured blood-vessels corresponding to it, if the trachea or larynx be flattened, or the cartilaginous rings of them laterally compressed; because these things indicate wilful violence, as such great injury does not take place from the natural

twisting of the navel-string. FODERÉ states,\* that instances have been known of suffocation having been produced by turning back the tongue on the glottis. This, it seems probable, must ordinarily be the effect of wilful violence. Foderé, however, asserts this only with the following modifications: "when the infant has not sucked, and when the frenum of the tongue is lacerated."

The external appearances often do not remarkably differ in the case of death from apoplexy before respiration has been effected, and in that from suffocation; so that it may not be possible to determine the cause of the extinction of life, before the internal organs have been examined.

*Death from apoplexy.*

The next subject for investigation, is the state of the umbilical cord; as it is certain, that death may result from hemorrhage from this part, when a ligature has not been applied to it. HALLER† supposed, that if the placenta remained attached to it, it would be fatal to the life of the infant; but PLOUQUET,‡ with apparent propriety, only admits the truth of this opinion when the expulsion of the placenta has been simultaneous with that of the fetus, when sufficient hemorrhage may take place from it to destroy the life of the

*Umbilical cord.*

\* *Med. Legale*, tom. iv. p. 495.

† *Element. Physiol.* t. x.

‡ *Comment in Process.* p. 331.

infant. Some few instances have occurred of a knot being formed in the cord ; and such an accident may have been the cause of death, by its being drawn so tight as to stop the circulation in it before the fetus has respired.

If the placenta be not attached to it, it should be observed whether the cord has been cut or torn, if there are marks of powerful twisting or ligature of it, and at what distance from the body the separation was made.

About the termination of the seventeenth century, doubts were first advanced respecting the necessity of tying the cord to prevent hemorrhage,\* which gave rise to much disputation ; and, although the error of the doctrine of the innovators soon became generally acknowledged, it is of considerable importance that a knowledge of the facts developed chiefly by that disputation should be acquired, and their relation to the subject under consideration pointed out.

The ligature of the umbilical cord is not indis-

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\* By Fanton, professor at Turin, (*Anat. Human. Corp.* p. 231); and, towards the middle of the last century, the dispute was warmly excited by Alberti, in 1731 ; and Schultzius, in a dissertation entitled *An umbilici deligatio in nuper natis absolute necessaria sit?* Halle, 1733; Eller (*Com. Lit. Nov. an.* 1733, p. 377); Trevius (*Epist. Med. For. de Fetu, &c.*) ; Sehael (*De Funic umb. del. non absolut. necess.*) ; Kaltschmied (*De Intermissa Fun. umb. delig. non. absolut. necess.*) ; Schweikhard (*De non. necessar. funic. umb. deligat.*) ; and Burton (*New System, &c.* p. 61,) agreed, that it was not necessary ; whilst Boemer (*De necess. fun. umb. deligat.*) ; Heister (*Dissert. de sum. neces. inspect. cord vasorumque major. sub. legali infant. sect. xiii.*) ; Haller (*Element Physiol.* t. x. p. 200) ; and Plouquet, (*opera citat.* p. 326,) entered the arena in favour of the necessity of the ligature ; and at length, as Haller states, *Eo redierunt etiam adversæ sententiæ Medici, ut funiculum ligare juberent.*

pensably necessary in all cases ; for, under certain circumstances, it may remain free, without the occurrence of hemorrhage : yet there are examples of fatal hemorrhage having resulted from it. Robust infants are more liable to hemorrhage, in the absence of the ligature, than those which are weak. The period at which the division of the cord was made, has much influence on the results of it : hemorrhage is much less to be feared when it has been effected after the infant has breathed and cried, (that is, when the new course of the circulation has become established,) than before this has taken place. The nearer the separation is to the body of the infant, the greater will be the danger of hemorrhage. When the cord has been cut by a sharp instrument, there is a greater disposition to bleeding from it than when it has been torn. It should be borne in mind, that the infant may be suffered to perish from hemorrhage from the navel-string, and then a ligature may have been applied to it : it will therefore be necessary to notice, whether or not there are signs of death from such a cause, although the cord may be tied. Those signs are, a bluish or dull pallid colour of the whole surface of the body, paleness of the viscera, want of blood in the large vessels, especially the veins, and in the cavities of the heart. But such effects cannot be attributed to hemorrhage from the navel-string, except when no other means for its occurrence are present, and when the body of the infant appears to be well

constituted, with a full and free development of the cord. When this part is shrivelled, in a body recently born, and its vessels in a state of extreme collapse, it may be supposed that the infant wanted blood for some time before its birth.

Should there be evidence of hemorrhage from the umbilical arteries or their ramifications, it must be borne in mind, that it might have taken place from the placenta during labour ; or, as Mr. JOHN BURNS states, rupture of the vessels of the cord may have happened at that time, and fatal hemorrhage thence resulted.\*

The presence of a considerable quantity of blood about the place where the infant has been found, or in the linen enveloping it, with want of ligature of the cord, must not be considered evidence of its perishing by hemorrhage, unless the proofs of it just described are present ; because artful women have left the infant in that state covered with their own blood, (that is, the mother's,) for the purpose of the inposition here indicated.

If the child has lived four or five days after its birth, the navel-string will, generally, have separated from the umbilicus, exposing an ulcerated surface, often presenting three papillous elevations, corresponding to the vein and arteries ;

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\* *Principles of Midwifery*, p. 130 ; Roederer makes a similar observation, *Element. Artis Obstetric.* §389.

and, on cutting into it, a little yellowish watery fluid is usually found effused between the remnants of the blood-vessels, sometimes with a little redness of the surrounding portion of the peritoneum. At an earlier period of infantine life, the most clear signs of the process precursory to this separation, are, a red areola round the navel, and sudden termination of the pervious umbilical vein and arteries in the disorganized cord ; these appearances being less remarkable in proportion to the more early age of the subject.

Having passed in review all the external parts of the body, it will be proper to trace any wounds or contusions that may be present throughout the whole of their course, and then to examine the great cavities in the order and manner I shall describe.

*Tracing the course  
of wounds and  
contusions.*

*Examination of  
the great cavities.*

The cranial cavity should be exposed, by making, in the first instance, an incision through the integuments of the skull, penetrating to the bone, from the root of the nose to the spinous process of the second or third cervical vertebra ; another incision of the same kind should extend from one ear to the other, passing transversely over the summit of the head. Each of the four triangular portions of integuments, thus formed, should then be detached from the cranium, beginning at their apex and terminating at their base ; the temporal and occipital muscles should then be separated in a similar man-

*The cranial  
cavity.*

*The cranial  
cavity.*

ner. After examining the state of the cranium, one of the parietal bones should be first removed, and then the corresponding portion of the frontal. This should be done without lesion of the vessels of the brain, or of the venous sinuses; and it may be best effected by first making a small incision, with the point of a scalpel, in the membrane which unites the frontal to the parietal bone: a blade of the scissars should be introduced into the opening thus made, and, following closely the margin of the parietal bone, the membranes uniting it to the frontal, temporal, and occipital, should be successively divided; but, in making this division, care must be taken not to open the lateral sinus, which always contains fluid blood, and which is situate very near the mastoidean angle of the parietal bone. To avoid this, it is necessary, when the point just indicated is approached, to deviate a little from the membrane, and to cut the parietal bone itself near its margin. When the membranes just indicated have been divided, the bone should be raised up and turned towards the summit of the head, and it should be entirely detached by cutting through the bone itself at a little distance from the median line; and thus the veins running into the longitudinal sinus escape injury. The corresponding portion of the frontal bone is to be removed with similar precautions. The same operations are then to be effected on the opposite side; and thus the greater part of the surface of the hemispheres of the brain

is exposed. This organ may then be examined in the ordinary manner. By adopting this method, the practitioner will not himself produce sanguineous effusion, to be afterwards attributed, perhaps, to external violence.

To expose the spinal canal, a longitudinal incision should be made through the integuments from the occiput to the sacrum, the integuments and muscles detached and turned on each side; one blade of a pair of strong scissars is then to be passed on one side under the annular portion of the last lumbar vertebra, as close as possible to the base of its transverse apophysis, and this portion of bone then divided. The same operation is to be practised on all the vertebræ, and on both sides. The posterior portion of the column may then be readily removed by the aid of a scalpel, and its contents well exposed for examination.

*The spinal canal.*

The cavities of the mouth, œsophagus, larynx, and trachea, may be best brought into view, by bending the head a little backwards, so as to render the integuments at the anterior part of the neck somewhat tense. An incision should then be made through the integuments from the lower lip to the upper part of the sternum, passing quite through the former part; another incision is to follow the inferior margin of the lower jaw; then the triangular portions thus marked out are to be separated from the parts beneath,

*Cavities of the mouth, œsophagus, larynx, and trachea.*

from their apices to their bases. The state of the anterior surface of the larynx and trachea may now be examined. The lower jaw is then to be divided at its anterior part, so as to separate it into two lateral portions, which may be turned aside by dividing with a scalpel all the parts which adhere to its internal surface. The tongue is to be gradually drawn down, until the isthmus of the fauces is stretched, the pillars of this should be cut through with a scalpel, and thus the whole of the pharynx is exposed ; by continuing the incisions last mentioned, on each side, at the same time drawing the tongue forward and downward, the commencement of the œsophagus will be brought into view : the rest of it may be hereafter examined. The portion of the alimentary canal thus exposed should be carefully inspected, especially with the object of ascertaining if there are signs of inflammation or ulceration of it. A ligature is then to be placed on it as it passes into the cavity of the thorax, and the upper portion separated. The respiratory canal now claims attention. The position of the epiglottis is first to be noticed, and then the interior of the larynx and trachea disclosed by making an incision through the thyroid, cricoid, and tracheal, cartilages, at their anterior parts. A ligature should be tied round the lower part of the trachea, and the upper part removed.

*Abdominal cavity.* The cavity of the abdomen is to be next exposed. An incision is to be made through the in-

teguments, muscles, and peritoneum, from the middle point at the lower part of the sternum to the groin, on each side. The portion of the abdomen situate between these lines is to be turned downwards as far as the navel, the hepatic ligament divided, ligatures put on the umbilical vein and arteries, and then the reversion of the flap of the abdomen completed. The umbilical portion of the vessels just designated must now be examined, to ascertain whether they contain blood, are freely pervious, or if they are in a shrivelled and collapsed state. The umbilicus itself may now be inspected. Turning to the cavity of the abdomen, the first thing to be noticed is the state of the *canalis venosus*, or the branch of the umbilical vein which passes into the vena cava. The utility of these observations will be hereafter shown: If effusion of blood or purulent matter be present, its source should be investigated. The surfaces of all the viscera are to be examined, and the solid viscera cut into with a scalpel; the contents of the gall and urinary bladders ascertained; and the intestinal canal wholly removed from the abdominal cavity, after having placed two ligatures on the œsophagus, and the same on the lower part of the rectum, between each of which the parts are to be divided. The contents of the stomach claim particular attention; and, if any thing more than simple mucous fluid exist in it, it should be examined by chemical tests. This remark applies especially to the possibility of poison having been exhibited;

and, on this point, the state of the mucous membrane of the stomach will furnish useful evidence. It is highly important, too, to know if it contain food, and the quality of this. If there be what appears like *water* in it, this should be accurately examined, to ascertain if there are any vegetable matters in it, as portions of weeds, straw, &c. and the microscope will be useful to examine if it contain insects, &c. These remarks apply especially to the consequences of death from drowning: a subject to be hereafter discussed. The interior of the whole intestinal canal should then be traced, with the same views, and to see whether or not it contains yellow bile or meconium.

*The thoracic cavity.*

The thoracic cavity may be exposed in the ordinary way, only it will be better to make the division of the ribs with scissars than with a scalpel. But, before any correct inferences can be drawn from inspection of the organs of this cavity, it is necessary that the peculiarities of the circulation of the blood and state of the lungs in the fetus,—the changes effected in the lungs and their blood-vessels by respiration,—the theory of the several tests to which the lungs have been exposed in relation to the subject of this dissertation,—and the appearances produced in the same organs by drowning, and respiration of deleterious gases, be well understood. These subjects I shall, therefore, now take into consideration.

§ VII. One of the most important organs of the circulation in the fetus, is the placenta ; it succeeds to those flocculent filaments which, in the first month of impregnation, cover the ovum externally. By its external surface it adheres to the uterus : its fetal surface is covered by the chorion and amnios, excepting at its centre, whence the umbilical cord arises. It is constituted of ramifications of blood-vessels from the two umbilical arteries and the umbilical vein. The umbilical cord extends from the centre of the placenta to the navel of the fetus : its length is ordinarily about two feet ; it is formed by the two umbilical arteries and the umbilical vein, united by dense and firm cellular tissue ; it is covered by the amnios and chorion. Having run thus from the placenta to the navel of the fetus, the umbilical vein passes into the cavity of the abdomen, and to the inferior surface of the liver : it there divides into two branches, one of which is distributed in the liver ; the other, termed the *canalis venosus*, passes immediately into the inferior vena cava. The heart and large blood-vessels of the fetus differ from those of the infant after birth. The valve in the vena cava, where this vessel is about to terminate in the right auricle of the heart, the Eustachian valve, is very large ; and there is a perforation in the septum of the auricles of the heart,—the *foramen ovale* : the pulmonary artery, after having sent two small branches to the lungs, terminates at the concave part of the arch of the aorta by a short canal,—the *canalis arte-*

CIRCULATION  
OF THE  
BLOOD IN  
THE FETUS.

riosus. The arteries of the umbilical cord having passed through the navel, run along the sides of the bladder, to which they are attached, to the internal iliac arteries, whence they may be considered to arise, whilst the umbilical vein has its origin in the placenta.

Tracing the course of the blood from the placenta, we find it pass through the umbilical vein to a very short distance beyond the umbilicus; there part of it enters into the liver, and the rest into the inferior vena cava: that which traverses the liver afterwards arrives at the same vessel. From the inferior vena cava the blood enters into the right auricle of the heart, being now mingled with that contained in the superior vein of the same name; and part of it flows from the right into the left auricle through the foramen ovale. The contraction of the auricles succeeds to their dilatation, the ventricles of the heart expand at the same instant, and the blood passes into the last-named cavities. The ventricles are then contracted, and the blood is driven from the left ventricle into the aorta, and from the right into the pulmonary artery; but, as the canalis arteriosus is much superior in diameter to the branches going to the lungs, it is evident that the greater part of the blood from the right ventricle must also flow into the aorta. The blood passes through all the divisions of the aorta, and returns to the right auricle of the heart by the vena cava, excepting, perhaps, that portion which

goes through the umbilical arteries to the placenta; but what becomes of this is not known.

CIRCULATION  
OF THE  
BLOOD IN  
THE FETUS.

There are, then, five channels for the course of the blood that are proper to the fetus, three of which always become obliterated soon after respiration has been established; the fourth, the *canalis arteriosus*, ordinarily so; and the fifth, the *foramen ovale*, is, in general, only partially effaced. The three first mentioned channels, are the umbilical vein, with its prolongation the *canalis venosus*, and the two umbilical arteries. The existence of those channels in the fetus is necessary, for the following reasons: vital communication between the mother and the fetus is requisite for the life and growth of the latter; this is effected by the medium of the placenta and the umbilical vein and arteries. It has been already stated, that the blood of the fetus is returned, in the course of the circulation, to the right ventricle of the heart: a channel through the pulmonary arteries to the lungs, and back again by the pulmonary veins, is the course of the blood to the left auricle of the heart, after respiration has been established; but the pulmonary arteries being very small, transmitting but very little blood, in the fetus, would furnish but a small quantity of this fluid to the left auricle of the heart by the course just designated: the aorta would, however, be well supplied with blood, endowed with *momentum* or *vis a tergo*, from the right ventricle of the heart, by means of the *canalis arteriosus* alone, were there no other

CIRCULATION  
OF THE  
BLOOD IN  
THE FETUS.

channel for the blood into the vessel which is to carry it to the body of the fetus generally; but the left ventricle of the heart would have hardly any blood to contract upon, and the force of it would be exerted almost in vain: such an evil is obviated by the foramen ovale, which transmits the blood freely from the right to the left auricle of the heart, and hence its ventricle is supplied. By this mechanism, the impulsive force of both the ventricles of the heart is chiefly exerted on the blood which traverses the aorta, and a vigorous circulation of that fluid is thus effected.

When the vital functions of the placenta cease, the blood, if transmitted to it by the umbilical arteries, is no longer returned from it by the umbilical vein; the circulation ceases in these vessels, they become devoid of use, die, and separate at the surface of the living body, that is, the navel of the infant. The canalis venosus, no longer receiving blood, collapses, becomes impervious, and is converted into a sort of ligament. The internal portions of the umbilical arteries suffer similar changes. The expansion of the lungs in respiration, and consequent dilatation of the pulmonary arteries, open a free passage for the blood from the right to the left side of the heart: this fluid no longer flows from the right auricle through the foramen ovale; it meets with resistance equal to its impulsive force in the blood now freely poured into the left auricle by

*Influence of respiration on the circulation.*

other means. It is, ordinarily, partially closed soon afterwards by a valve, but it may remain fully open without injury to the circulation. The pulmonary arteries now receive all the blood expelled from the right ventricle of the heart: the *canalis arteriosus*, consequently, loses its former supply; this vessel contracts, from the absence of distensive force, and is at length obliterated. The left branch of the bronchiæ is carried forwards and upwards, as the left lung becomes dilated by respiration; and, as it passes behind the *canalis arteriosus*, this vessel must be thence stretched in length, and by this means its obliteration may be promoted. The process towards this destruction of the useless channels may be discerned within a day or two after respiration has been established, excepting only that of the *foramen ovale* in some instances.

§ VIII. The lungs of the fetus are small, dense, compact, of a deep-red colour, transmit but little blood, and are of specific gravity greater than that of fresh-water; they, consequently, sink in this fluid: but, on the introduction of air into them by *respiration*, they become more voluminous, of a yielding elastic texture, of a pale bright-red colour, contain and transmit a large quantity of blood, and are of specific gravity less than that of fresh-water; they, consequently, float in this fluid.

CHARACTERS  
OF THE  
LUNGS OF THE  
FETUS.

*Changes effected  
in the lungs by  
respiration.*

*Application  
of the evidence  
thence derived to  
the subject of  
this dissertation.*

Respiration is necessary for the maintenance of the life of the infant after its vital connexion with the mother has ceased, and respiration is not established, generally speaking, until a few instants before the cessation of this connexion takes place. Here, then, are means indicated by which it might be known whether or not a child has lived after its birth, that seem, at first view, to be positive and absolute; and they were considered to be so for several years after they were resorted to as evidence in forensic enquiries respecting the subject of this dissertation.\*

*Various means  
for inferences  
from the changes  
effected in the  
lungs by respira-  
tion.*

The phenomena above described present, however, means for various inferences, of different degrees of validity, respecting the subject under consideration; and, as they are of very great importance, I shall examine them each, in succession, with the care they seem to require.

#### HYDROSTA- TIC TEST OF THE LUNGS.

§ IX. When the lungs of infants were first subjected to examination, in an enquiry of this kind,† the only mean resorted to was immersion of those organs in water, for the purpose of ascertaining whether they would float or sink in this fluid; and, as the former or the latter resulted from the test, it was concluded that the

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\* Beierus, *Delinial. Juris Crim.*; Marchiori, *Miscell. Criminel.*

† This was not done, it appears, until after it was inculcated by Langius, Rivinus, and Swammerdam.

infant had, or had not, lived after its birth,\* and these inferences were admitted as positive evidence in forensic enquiries. But, a critical examination of this measure, aided by pathological observations, soon placed its validity in doubt in the generality of cases, and proved its fallacy on several occasions. The observations of BOHN,† HOFFMANN,‡ and HEISTER,§ proved that the lungs of a fetus born dead will, under some circumstances, float in water, and those of one that has lived after its birth sink in the same fluid; and many other physicians have since had occasion to experience the correctness of their statements. These deviations from the ordinary circumstances may arise from the following causes.

OBJECTIONS  
TO THE VA-  
LIDITY OF  
THE HYDRO-  
STATIC TEST.

It is proved that an infant may respire whilst it is in the uterus, when its mouth presents at the dilated orifice of that organ, and the vagina admits a free passage for air to it. Some respectable men have denied the possibility of this,|| which it is very easy to do; but, other at least equally judicious men and well-informed physiologists, have thought it possible; and several obstetric practitioners of great respecta-

*A fetus may breathe whilst in the uterus, or when its head alone is without the vagina.*

\* Baglivi was convinced of the security of the test above designated; his expressions on this point are absolute: *Pulmones fœtus mortui in utero matris, si extrahantur, et in aqua ponantur, petunt fundum; mortui vero extra uterum et aqua injecti innatant in ea. Quod signum ad infanticidium detegenda est evidentissimum.*—(Op. omnia, p. 299.)

† *De Offic. Med. De Vulner. renunciat.*

‡ *Op. Pathol. Pract. tom. i.*

§ *De Fallaci Pulmon. Infant. Experiment.*

|| Amongst whom may be expressly designated Camper (in his *Eene Grechtelyke en Onleedkundyndige Verhandeling over de tekenen van leven en dood in de nieuwgeboorene kinderen*), and Roederer (*Satura de Suffocatis*.)

bility and worthy of credit, have stated that they have heard the infant cry whilst in the uterus, in the situation above mentioned.\* It must be sufficiently evident, that the infant may perish during its birth after respiration has thus taken place. It is stated by Dr. HUNTER, that “a child will very commonly breathe as soon as its mouth is born, or protruded from the mother, and in that case may lose its life before its body be born; especially when there happens to be a considerable interval of time between what we may call the birth of the child’s head, and the protrusion of its body. And, if this may happen when the best assistance is at hand, it is still more likely to happen when there is none; that is, where the woman is delivered by herself.” And he adds, “If a child makes but one gasp, and instantly dies, the lungs will swim in water as readily as if it breathed longer, and had then been strangled.”†

*The lungs will float from putrefaction.*

It has been found that the lungs will float in water in consequence of putrefaction having taken place in them.‡ Putrefaction must, however, be very far advanced before this phenomenon will thence result, and before such a degree

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\* These are, Idena (*Gedagten om het Dryven en Zinken der Longe Leeuward*;) Croezer (*Ontwerp van de eerste Inademing*;) Ficker (*Beytraege zur Arzneyen*, Hest. ii. p. 130;) Schmitt (*Neue Vers. und Erf. über die Lungenprobe*;) Ossiander (Salzburg, *Medizinische-Chirurgische Zeitung*, 1809, band. ii. p. 27;) Siebold (*Ann. der Entbindungskunst*, b. i. p. 100;) and Thilenius (*Loder’s Journal*, iv. p. 638.)

† *On the Uncertainty of the Signs of Murder in the Case of Bastard Children.*

‡ Alberti (*De Pulmon. subsident*;) Moigagni (*De Sedibus*, &c. tom. i.) Haller (*Op. Anat. Min.* t. i. p. 326. *Auctarium ad Physiol.* lib. viii. § iv. p. 37;) Wrisberg (*Nov. Comment. S. R. S. Gottingen.* tom. vi.) Jaeger (*Dissertat. de Fætib. rec. natis*;) Plouquet (*Comment. in process crim.* p. 272.)

of putrefaction takes place in those organs, under ordinary circumstances, that of the body generally will have proceeded almost to the last stage. This was proved by CAMPER. “In order to ascertain,” he says, “to what degree putrefaction would advance in an infant before its lungs would float in water, I made different experiments, at Amsterdam, on this subject; and I have found that, in those who had died before birth, the head may be so far decomposed by putrefaction, that the slightest force was sufficient to detach the bones of it from each other, as well as those of the arms and legs, before the lungs, which now began to participate in the putrefaction, would float in water.”\* These observations are derived from expositions of the bodies of infants in water as well as to the air on land.

On making incisions into lungs in which putrefaction has made a certain degree of progress, we see air-bubbles forming strata between the ramifications of the bronchiæ, visible to the naked eye, which is never the case when the air-cells solely have been filled by respiration. But there is another mean for determining whether the air or gas diffused in the texture of the lungs has been introduced into them by respiration, or generated by putrid decomposition, that furnishes

*Means of rendering null the last objection.*

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\* *Over de Oorzaaken van Kindermoord en van Zelfs moord. Waar by twee Proeven over de inblaazing der lucht in de longen van Kinderen welke dood ter waereld zyn gekomen. Leeuwarden, 1744.*

*Means of rendering null the last objection.*

much more clear, and, indeed, certain evidence. Portions of the lungs should be pressed between the fingers, or twisted in a folded cloth, with all the force a man of ordinary strength can exert by his bare hands: if the gas has arisen from putrefaction, the portions thus treated will sink in water, whilst portions of lungs that have been distended by respiration will float in it after pressure made in this way; that is, when the texture of the part has not suffered sensible decomposition from putrefaction. A lung dilated by respiration gives rise to a sort of crepitation, on being compressed by the fingers, or cut into by a scalpel, that is very peculiar, and may be easily distinguished by an attentive observer who has once noticed it. This does not take place in the state of emphysema from putrefaction; nor will a certain degree of putrefaction prevent its being discerned in the lungs of an infant that has respired.

LECIEUX\* states, that when the fetus has been extracted by the feet, especially when the pelvis has been very narrow, he has several times found a portion of the lungs float in water, although the fetus certainly had not respired, and died during the birth. He could not attribute this to putrefaction, because the body presented no signs of such a state, and he made his examination soon after its delivery. He conceives that the lungs had here suffered contusion, with extravasation of blood, from which bubbles of gas

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\* *Considerations sur l'Infanticide*, p. 55.

had been disengaged; and hence the part immediately thus affected became specifically lighter than water. The accompanying circumstances already indicated must, in the greater number of cases, furnish the means for distinguishing this fact; and, should these fail, pressure of the part in question between the fingers will determine the question, by causing it to sink in water. The appearance of the air-bubbles will be also different, as was shown on a former occasion.

“ It is so generally known that a child born apparently dead,” says HUNTER, (who let nothing escape his penetrative views that was calculated to make the physician pause before he pronounced a criminative decision on this occasion,) “ may be brought to life by inflating its lungs, that the mother herself, or some other person, might have tried the experiment. It might even have been done with a most diabolical intention of bringing about the condemnation of the mother.” It has, however, been disputed whether or not this would cause the lungs to float, and the fact has even been denied by men of respectability. But no doubt should be entertained on this subject. CAMPER several times made the experiment of blowing air into the mouth of children born dead, and who certainly had not respired, and he always found the lungs

*Objections in the  
consequence of  
artificial insuff-  
flation.*

readily expanded by this mean.\* It succeeded also several times with JAGER,† SCHMITT,‡ and BUTTNER. The last-mentioned physician had occasion to witness an instance in which this practice was really resorted to by a mother, and with the result just designated.§ AUGUSTIN also relates a similar case.|| But the other effects of this measure are different from those produced by respiration. Insufflation of this kind, in a fetus that has not breathed, dilates the lungs, and renders their specific gravity less than that of water; but the arteries and veins are not dilated by this action, nor the absolute weight of these organs thereby augmented, which are the consequences of respiration. But here I anticipate a view of the subject, that should be taken after some other points have been discussed.

*Invalidation of  
the last objection.*

*Will not always  
present the ex-  
pected result.*

Another objection that has been made to the *hydrostatic test* of the lungs, is, that these organs will sink in water, in some cases, although the infant has lived and respired for several hours after its birth. Observations proving this fact have been made by HEISTER, MORGAGNI, HALLER, DE HAEN, HOFFMANN, ESCHEMBACH, KANNEGIESSERO, WRISBERG, PLENCK, PLOUQUET, LODER, BECKER, SCHOLL, KIEFER,

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\* *Eene gerechtelyke en onleedkundige Verhandeling over de tekenen van leven en dood in de nieuwgeboorene kinderen*, p. 86.

† Salzburg, *Medico-Chirurgische Zeitung*, b. iii. p. 55.

‡ *Neue Versuch und Erf über die Lungenprobe*.

§ *Vom Kindermord*, p. 53.

|| *Archiv. für Staatsarzneykunst*, i. p. 50.

MENDEL, PREU: and SCHENCK relates an instance\* of an infant having lived four days, and cried several times, whose lungs sank to the bottom of a vessel of water. This circumstance may arise, either from some disease of the lungs of the tuberculous kind, or great sanguineous congestion, preventing more than a small portion of the lungs becoming dilated; or the same thing will ensue from want of sufficiently forcible respiratory efforts. Several of the physicians just named have well ascertained, indeed, that the lungs of infants are in general dilated gradually, and that many days often elapse before they are fully distended. The left lobe is very often not at all dilated for some days, as PORTAL and METZGER have proved. This fact had indeed been observed long before by BLANCARDI.† I have been informed by a late physician to the Foundling-hospital at Naples, who opened daily, on an average, the bodies of ten or twelve infants, which had generally died within twenty-four hours after birth, that he hardly ever found more than a very small portion of the lungs dilated by air: this portion was frequently not larger than a walnut in its green shell, and but rarely larger than a hen's egg, and it was commonly situate in the right lung.‡ These facts show the necessity of making the

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\* *Journal der Practischen Heilkunde*, band. xxviii. seit. 3.

† *Anatom. Reform.* p. 71.

‡ It should be understood, that these children had never been fed before they were placed in the *turning-box* at the hospital; which, with the want of due warmth, &c. may have prevented their lungs being as much dilated as those of children of the same age are, perhaps, under ordinary circumstances.

hydrostatic test with portions only of the lungs, as well as with the organs in an entire state ; because an infant may live with such a portion of the lungs dilated as will not render the specific gravity of the entire viscera less than that of water. I have seen a case where the right lobe, when separated from the left, sank in water, though this was the most dilated by respiration, and the infant had lived forty hours and cried pretty strongly : but it died from suffocation by being *over-laid* (as it is popularly termed) by the mother, which had produced such an engorgement of blood in the lungs, as to counter-balance the influence the small quantity of air they contained could have on their specific gravity. A piece somewhat more than a cubic inch in volume was the greatest portion that in this case floated.

*Value of the objections to the hydrostatic test.*

It appears, from the foregoing enquiry, that the only well-founded objection to the validity of the *hydrostatic test*, as a mean for the decision of the question, whether or not a child has *respired*, is that indicated by the possibility of *artificially* dilating its lungs with air, by blowing into its larynx ; a fact established by the cases cited in a former part of this dissertation. The means for ascertaining whether artificial inflation has been practised, have been already indicated ; they will be now more particularly described. I shall afterwards notice another test to which the lungs have been subjected, and the phenomena

intimately related to them, and then return to the hydrostatic test, for the purpose of designating its utility in a more particular and positive manner ; as it is not until the circumstances last alluded to are taken into consideration, that its value can be correctly appreciated.

§ X. More precise and comprehensive views of the changes effected in the lungs by respiration, at length showed that the alteration of the specific gravity of those organs in relation to their volume, was not the only mean they furnished for determining the question under consideration. The establishment of respiration is accompanied with an increase of the flow of blood to the lungs : the pulmonary arteries, which before this was effected had been very small in diameter and in a somewhat collapsed state, now become dilated ; their ramifications in the lungs become full of blood, and a considerable addition to the *real weight* of the lungs is thus made. These changes cannot be produced by artificial insufflation after death, or after the action of the heart and the circulation of the blood have ceased.

EXTENSION  
OF THE  
MEANS OF IN-  
FERENCE  
FROM THE  
CHARACTERS  
OF THE  
LUNGS.

It was on these principles that PLOUQUET\* founded his mean for procuring additional evidence respecting the existence of respiration. He found, on examination, that the body of a

PLOUQUET'S  
*test.*

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\* *Commentarius in Processus Criminales*, sect. ii.

male infant born dead, and which had not respired, weighed 53040 grains, comprising the lungs, and that these organs alone weighed 792 grains: the proportion of the lungs to the body was, then, as 1 to 67. In another infant, he found the proportion as 1 to 70. He then examined a third, born at the full period, and which had respired: here the proportion of the weight of the lungs to that of the body, was as 2 to 70.

*Objections to its  
validity.*

Some objections of but little import were first advanced against this *assay* (it is thus termed) of Plouquet. Thus METZGER\* remarked, that Plouquet had paid no regard to the effects of hemorrhage from the navel-string; but JAGER replied to this,† by saying that hemorrhage would affect the whole system in the same ratio, or nearly so, as the lungs, and then the same relative weight between them would still exist. But a greater difficulty was advanced by HAARTMANN,‡ who stated that he had not found the relation of the weight of the body to that of the lungs even nearly similar to that mentioned by Plouquet; and the latter confessed that he had founded his statement on the examination of only three bodies. Haartmann gives about 48 to 1, as the proportion after respiration has been effected, and about 59 to 1, as that existing before respiration. STRUVE stated, that he had found no constant relation between the weight of the lungs and the body under these circum-

\* In *Loder's Journal*, ii. 141.

† *De Vita Neogeni*, p. 38.

‡ Stockholm, *Acad. Handl.* tom. xx. p. 40.

stances;\* and the experiments of SCHMITT showed similar results. The reason of this diversity, without considering the influence of variation in the original construction of the body, is sufficiently accounted for, by the great diversity in the manner in which respiration is established in new-born infants. It seems to be proved that, in a great proportion of them, it is effected but gradually and slowly, and that several days elapse before the lungs are fully dilated.

LECIEUX relates the results of four hundred examinations of bodies of children, made at the Hospice de la Maternité at Paris, for the purpose of furnishing some evidence on this subject; and the results of them are almost as various as it was possible for them to have been, within a certain range. It appears from them, that, in one instance, the proportion of the weight of the body to that of the lungs, was no greater than 27 to 1, (that of the body being 1958 *grammes*, which is below the medium,† this being about 2400,) in a male infant of the full term born dead, and presenting no remarkable appearances; and there were several cases of fetuses, born under similar circumstances, except that the weight of the body was of the medium standard, presenting nearly as low a ratio. The proportion was as low as 10 to 1 in one instance, in a male infant of the full term, weighing 2600

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\* *Dissert. de Docimas. Pulm. Ploucq.*

† One gramme is equivalent to 189·837' grains.

grammes, which lived eleven days. No remarkable appearances were noticed in the body. In a male fetus of eight months, born dead, presenting no remarkable appearances, the proportion was as great as 131 to 1, the weight of the body being 1836 grammes. In several instances, under similar circumstances, in females as well as in males, the proportion was from 80 to 100 to 1. In a female of the full term, dead born, presenting no remarkable appearances, weighing 2570 grammes, the ratio was 86 to 1. In another, that died during labour, which was very long, the proportion was 94 to 1; the weight of the body being 3000. In a male, dead-born at the full term, with nothing remarkable, the weight of the body being 3672, the proportion was as high as 90 to 1. In a male infant of the full term, who lived four days, weighing only 2150 grammes, and where no remarkable appearances were noticed in the body, the proportion was as 48 to 1. In another instance it was 43 to 1, at the age of ten days, where the weight of the body was 2250 grammes. But, under similar circumstances, it rarely exceeded 40, even after only a few hours of infantine life; and it generally was about 30 or 35, in those who lived from three or four to eight or ten days, the body having been about the medium weight. These observations are sufficient to show how difficult, and indeed apparently impossible, it will be to establish any standard in regard to the *assay* of Plouquet, that can be applied to it with precision. I need only point out, that the mini-

imum of the ratio of the weight of the body to that of the lungs before respiration often passes below the common ratio after respiration has been established, and occasionally extends nearly as low as the minimum of the latter ; so that the instances in which any standard could be relied on in an absolute manner must here be extremely rare. On the other hand, the ratio after respiration has been established, is often higher than the medium ratio before respiration : and therefore the same difficulties present themselves in this as in the former view of the subject.

It is necessary to speak here of the tests proposed by DANIEL, though one of them is founded on the same principle as that of Plouquet, and the other cannot be relied on with much confidence. He stated, that we might judge of the existence of respiration by the increase of weight given to a certain quantity of water in which the lungs had been strongly compressed, as this would gain what the lungs lost by the expulsion of the fluid they contained. All the objections to the measure of Plouquet apply still more forcibly to that of Daniel. The other test is founded on the increased circumference of the thorax, and the vaulted appearance it assumes after respiration has been established. The circumference of the thorax varies so much in infants of the same age and sex, both absolutely and in proportion to other parts of their body, that it cannot be possible to obtain any decisive evidence from this mean. The vaulted appearance

DANIEL'S  
*tests.*

of the chest is almost equally fallacious in the generality of cases, or else it is devoid of utility ; because the figure of the thoracic parietes is not much changed until respiration has been fully established, and then we have other and more certain means of detecting its existence. Besides this, it appears, from the experiments of SCHMITT,\* that the thoracic parietes were distended outwards by artificial insufflation after death, as much as they are by actual respiration as it occurs in the new-born infant.

Although the results of the assay of Plouquet may not furnish positive evidence of the establishment of respiration, it is proper that it should always be employed, as the indications it furnishes are of more or less utility in conjunction with the hydrostatic test and the physical characters of the lungs designated as resulting from the performance of the function of respiration. I shall give a summary of the inferences that may be drawn from the whole, after the means of prosecuting the tests under consideration have been described.

ANATOMICAL  
EXAMINA-  
TION OF THE  
THORACIC  
ORGANS.

§ XI. We return, then, to the body of the infant, and expose the cavity of the chest in the usual way, taking care not to cut or destroy unnecessarily any of the parts it contains. The situation of the different organs exposed to view should then be accurately noticed ; especially whether the lungs are collapsed or dilated, and

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\* *Versuch und Erf über die Lungenprobe.*

whether they cover the lateral parts of the pericardium. Any signs of disease that may be present, are to be carefully examined; and, if blood, or purulent or other analogous matter, be effused in the cavity, its origin should be sought for, and the cause of its presence determined as exactly as possible. If any blood-vessels, or the heart, are found ruptured, care must be taken to ascertain whether this can be traced to external violence, and whether this arose from wilful and criminal means, or the act of parturition. Ligatures may now be put on the aorta and venæ cavæ, near their attachment to the heart; the trachea removed close to the bronchiæ; the vessels cut beyond the ligatures; and the heart and lungs, attached together, then removed from the cavity of the thorax. If bloody, they should be cleansed with a sponge; and then the colour of the lungs, their consistence and elasticity, and their state with regard to healthy structure, distinctly noticed, without compressing them forcibly, or lacerating in any way their structure. If the body generally be in a state of putrid decomposition, it should be ascertained whether the lungs are also thus affected, and in what degree. A livid colour of the lungs, from congestion of dark-coloured blood in the minute vessels, should not be mistaken for gangrene: an appearance of this kind seems often to have the same origin as the lividness of the surface of dead bodies. The lungs are to be turned with the bronchial trunks downwards, that any fluid

which may be contained in these tubes may flow out ; and whatever escapes from them should be preserved in a clean vessel. These organs are then to be weighed in conjunction with the heart.

*Mode of practi-  
sing the hydro-  
static test.*

A vessel, of a foot or a little more in diameter, and of at least a foot and a half in depth, is to be filled to the height of not less than a foot with pure, *fresh*, and, if possible, *river*, water, the temperature of which should be nearly equal to that of the air, unless this be very cold or very hot. The lungs and heart, still attached together, are to be placed in a gentle manner in this water. It must then be remarked, whether they float near the surface of the water, or sink to the bottom ; whether they fall suddenly, or descend slowly ; whether the lungs turn uppermost, and float near the surface of the water or about the middle of the fluid.

The heart is now to be separated from the lungs, having previously applied a ligature to the pulmonary vessels, to prevent the escape of the blood they may contain ; and the weight of the heart alone then determined, that it may be subtracted from that of the heart and lungs together, previously ascertained.

The lungs are now to be placed alone in the water ; and great attention must be paid to the position they assume in it : that is, whether they

sink rapidly or slowly, or float near the surface ; whether, by reversing their vertical situation in the water, they sink more readily or with more difficulty ; and, if any part constantly rises and is drawn under water by the rest, this part should be particularly marked.

*Mode of performing the hydrostatic test.*

The two lobes must be separated, and the above-mentioned experiment made with each distinctly, and any difference in the results remarked : if one lobe float and the other sink, it should be noticed whether it is the right or left that floats. Each lobe is then to be cut into several pieces, taking care not to confuse those of the right with those of the left ; and the following circumstances attended to whilst this division is effected : Whether or not there is the crepitation which is always heard on pressing a lung dilated by respiration ; but it must be borne in mind, that a similar crepitation may arise from a lung artificially dilated by air. If emphysema be present, whether the air exists in the proper air-cells, or is diffused in the general texture of the lungs ; and if this texture be dilated into visible globules by the air. Whether the vessels contain much or little blood, or if they, especially the branches of the proper pulmonary arteries and veins, are entirely devoid of it ; if they are, whether the other blood-vessels are also empty, because this state of vacuity of the lungs may exist as a consequence of hemorrhage, though respiration has been established. Portions of

them should be pressed under water, in order to discover whether bubbles of air escape from them. The state of their structure, with regard to health and disease, may be again examined. Each portion should be separately placed in water; and these portions are to be put in, first of a moderate volume, and then after having been cut into small pieces; and, lastly, after having suffered forcible compression between the fingers. If putrid decomposition has taken place in them, portions of other organs of a somewhat similar structure, as the spleen and the liver, should also undergo the hydrostatic test.

The large blood-vessels must now be carefully examined, especially the veins and the *canalis arteriosus*; and lastly, the heart itself, to ascertain if it presents any morbid appearance, and if the *foramen ovale* of the auricles remains fully open; and the portion of the *œsophagus* which traverses the thoracic cavity should not be forgotten in this examination.

DEATH FROM  
DROWNING.

§ XII. While this examination of the lungs is made, the practitioner should bear in mind the possibility of the child having perished from drowning, and other analogous means; and, when it has been found in water, it will be necessary for him to determine whether it was put into it before or after its death. This leads me to describe the way in which death takes place from

the cause above indicated, and the phenomena by which it may be known to have taken place.

When a living animal, the functions of whose heart and lungs are similar to those of man, and bear the same relation to its vitality, is plunged into water, the action of its heart becomes quickened; it appears to suffer great oppression of the chest; it struggles, gains the surface of the water, and a certain quantity of air escapes from the lungs; its anxiety then increases, the action of the heart becomes weaker, it struggles violently, and another and more considerable quantity of air escapes from the lungs: it makes some efforts to respire; water enters into the mouth, and ordinarily thence into the trachea; a certain quantity, also, sometimes passes into the stomach: the skin assumes a blue colour, the action of the heart gradually ceases, and the animal falls to the bottom of the water without sense or motion. Two or three minutes constitute the ordinary period of the duration of the above phenomena. *Phenomena of.*

On opening the body soon after death, the cavities of the right side of the heart, and the large vessels which arise from them, are distended with a large quantity of black blood; the left cavities usually contain a much less quantity of similar fluid, and are sometimes entirely empty; the pulmonary veins and arteries are filled with dark-coloured blood, and the bronchial tubes ge-

nerally contain a certain quantity of frothy aqueous fluid. The diaphragm is thrust far into the abdominal cavity. The tongue often projects between the lips. The stomach most ordinarily contains some water. The blood is always fluid. The surface of the brain is of a dull red, or somewhat livid colour, but its vessels are not in general gorged with blood, neither is there here extravasation of this fluid. The pupils are generally widely dilated. The surface of the body is commonly pale, but sometimes remains of a purplish hue. It is not necessary for me to give an account of all the opinions that have been formed respecting the cause of death from submersion in water: the experiments of GOODWYN proved that it essentially depends, in the generality of cases, on the want of air, and not on the presence of water in the bronchial tubes, as was generally supposed at a former period. In some cases no water passes into the trachea, or the stomach; and this fact is adduced by CULLEN, in confirmation of the opinion of Goodwyn. In a very small proportion of cases, as KITE and WALTER have proved, a state of apoplexy has concurred with the want of air to produce death.

*Theory of.*

*Application of  
the phenomena.*

Nearly all the signs above designated, as those of death from drowning, may, however, when individually regarded, be present in cases of death from other causes.

The livid appearance of the surface of the

body will be commonly found in cases of death from apoplexy or convulsions ; and the pallidness from numerous causes. The dilatation of the pupil is not more peculiar to it. Engorgement of dark blood in the vessels of the brain is not constant, and the same thing may happen from suffocation in any other way. The congestion of blood in the right side of the heart, and the vacuity of the cavities and vessels of the same side of this organ, will be found in most cases of sudden death. The presence of water in the bronchial tubes is a more important circumstance ; and, when it exists in lungs that evince signs of respiration having been established, and the body shows no sensible marks of putrefaction, it may be considered almost conclusive : only care must be taken not to mistake the aqueous secretions into the bronchiæ for water inhaled from without. If there are present in this water pieces of straw, weeds, insects, or other foreign substances similar to what are found in the water where the body was discovered, and putrefaction has not commenced, the evidences of death from drowning are decisive. If the stomach contain water, it should be compared to that found in the lungs. When a dead body is submerged in water, this fluid never enters the organs just designated before the body has passed into some degree of sensible putrefaction. The protrusion of the diaphragm into the abdominal cavity may make us more satisfied with our conclusions from the phenomena last described.

*Their similarity  
to those arising  
from respira-  
tion of impure  
air and deleterious  
gases.*

The fluidity of the blood is another very important sign ; but it does not positively indicate death from drowning, for it is found in cases of death from other causes, especially from lightning, some narcotic poisons, and respiration of deleterious gases. Nearly all the phenomena above described will be present after death from want of air, effected by strangulation : that is to say, the surface of the body, especially of the face and head, will be tumid and livid ; there will be a large quantity of black blood in the right cavities of the heart, and in all the venous system ; and the brain will be engorged with blood. In cases of death from want of renewal of fresh air, when an animal is enclosed in a box or other similar machine, there is also accumulation of black blood in the right side of the heart and in the veins, and a smaller quantity of similar blood in the left side of the heart and the arteries which thence arise : but the brain is not gorged with blood, and the surface of the body is generally pallid.

When death has been produced by the vapour arising from burning charcoal, (which is composed of gaseous oxide of carbon and carbonated hydrogen gas,) the body presents several peculiar appearances. It preserves its heat for a long time after apparent death ; there is great accumulation of black and very fluid blood in the veins, and hardly any in the arteries ; the vessels of the lungs and brain are especially

gorged with this fluid ; the face is red and somewhat tumefied ; the rest of the body is also a little tumid, and sometimes presents, in different parts, violet-coloured patches ; the eyes are bright, and the lips have a vermilion hue.

The appearances after death from asphyxia caused by the gas of privies, (sulphurated hydrogen gas,) have been very particularly remarked by Professor CHAUSSIER.\* The nasal cavities and the bronchial tubes are lined with a brownish viscous mucus ; the blood is black and thick ; the lungs, liver, spleen, brain, and all the organs in general that are abundantly supplied with blood-vessels, are of a dark-brown or blackish colour ; the muscles are also blackish and lax ; and all the soft parts are very easily torn, and pass readily into putrefaction.

These are the only cases of this kind that are likely to relate to new-born infants ; and the medical practitioner will have perceived of how much importance accurate knowledge of the situation in which the body was discovered, may become, on many occasions, when he is required to determine the precise cause of its death.

§ XIII. Having thus completed the anato-

CONCLUSION  
OF THE ANA-  
TOMICAL EX-  
AMINATION.

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\* *Journal Generale de Medecine*, Oct. 1802.

mical examination, the practitioner should collect the several parts of the body that have been detached, place the viscera in their proper cavities, and sew up the different incisions he has made. If, in any case, the inquest does not terminate at one sitting, and it may, consequently, be necessary to recur to inspection of the body, either to verify any point, or to examine others anew, it is advisable that the seal of the legal authorities taking the inquest should be placed on the linen enveloping the body, in such a way, that both the Jury and the Medical Practitioner may know, before a new examination be resorted to, whether or not the body has been touched by any insidious person during the interval. The possibility of a necessity for a second inspection, shows the propriety of not filling up the cavities of the body with saw-dust, or any foreign matters, as is sometimes done, for the purpose of absorbing the effused blood and other fluids. The above measures for the security of the body, will be particularly necessary in cases where the stomach or other part of the alimentary canal is carried away, to be examined at leisure, and in a more favourable place, when death is suspected to have arisen from the administration of poison. But no portion of the body should ever be taken away, except in cases of absolute necessity, as in that just designated; and the part thus appropriated should be described in the notes of the practitioner.

§ XIV. As the inferences from the several series of facts which may have been developed in the course of the examination just described, were distinctly drawn as those facts were passed in review, excepting those which relate to the lungs, it only remains for me to take these into consideration, and to adduce some general conclusions from the whole, in order to show the decisions that should be formed in any certain case, in respect to the first three objects of this inquiry, (§ v.)

SUMMARY OF  
THE INFER-  
ENCES FROM  
THE FORE-  
GOING EVI-  
DENCE.

The lungs present, in their construction and by means of the phenomena developed by them when submitted to the tests described in a former part of this dissertation, the facts from which we may draw the following inferences, in a more or less decisive, and in some cases in a positive, manner. 1. Whether or not respiration had been effected. 2. Whether or not the child had breathed after it was completely born. 3. Whether or not it had died from drowning; or, 4, from respiration of certain deleterious gases: and 5, whether or not it had died from suffocation, effected otherwise than by the two last classes of measures.

*Inferences from  
the state of the  
lungs.*

When the lungs are small, dense, compact, of a deep-red colour, and the bronchial tubes and air-cells are devoid of air throughout the whole extent of both lungs, it may be concluded, positively, that respiration has not been performed.

When those organs are of a yielding elastic texture, of a pale bright-red colour, and when they crepitate on pressure by the fingers, and contain air diffused to a greater or less extent throughout the bronchial tubes and air-cells of one or more of their lobules; and when they wholly, or the portions of them distended with air as just described, float in fresh water after having been compressed for about a minute in a folded cloth with all the force a man of moderate strength can exert with his bare hands, it may be concluded, positively, that respiration has been performed. Thus, the inferences of the first class may always be drawn in an absolute manner; that is, when the lungs have not undergone considerable decomposition from putrefaction, or from some disease: in these cases, the portion of the lungs in which respiration has been effected, may have lost its elasticity, and will not then spring out and become filled with air, on the compression above described being removed.

The second class of inferences cannot always be drawn in a positive manner. But, when the lungs present the signs of respiration mentioned in the last paragraph, and after having been compressed in the manner there described, they, with the heart attached to them, (as designated § *xi.* page 60), float but just below the surface of the water, in the hydrostatic test, a confident judgment may be formed that the

child had lived and breathed after it was completely born.\*

When the lungs will not support the heart near the surface of the water, but will still float alone in that situation, after having suffered compression, and it appears that they have been fully dilated by respiration, but that a morbid congestion of blood or inflammation has since rendered some portion of them impervious to air; there are good grounds for a strong suspicion of the existence of life after birth; but those grounds alone will not admit of more than suspicions. But if, with the above phenomena, there are present the signs about the navel indicative of the natural process by which the navel-string is separated, (supposing it not to have been yet thrown off,) and the commencement of the destruction of the *canalis venosus* and other umbilical vessels; those suspicions must be changed for a positive belief. Of course, the presence of food in the stomach partially digested, is an equally valid basis for a similar belief.

When the lungs present signs of respiration,

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\* There is no case in the existing records of medicine that furnishes evidence in opposition to this judgment; and the strictest physiological reasoning would make us firmly believe that such a case will never occur. Before the lungs can be dilated with air sufficiently to make them float in the manner under consideration, respiration must have been established for a considerable length of time, and the chest must have been permitted to dilate with perfect freedom; and these are circumstances which cannot rationally be supposed to exist whilst the child is contained in the uterus, or when its body is surrounded by the vagina of the mother during its birth. The state of the lungs under consideration, is, indeed, but very rarely witnessed when the child has not lived at least two or three days after its birth.

but have been only partially dilated with air, and, when entire, sink in water, or float very near the bottom of the vessel, they do not in themselves furnish grounds for a well-founded presumption of the existence of life after birth; because they may be dilated sufficiently to make them float in a similar way before the child is born. The state of the blood-vessels of the lungs, (§ *x.* p. 53,) and Plouquet's test, might furnish evidence on which suspicions of the continuation of life after birth may be raised; but, without some other evidence to support them, (such as that mentioned in the last paragraph,) they must be regarded as only conjectures.

The grounds for the third and fourth classes of inferences were discussed on a former occasion, (§ *xii.*) but it may here be remarked, that the signs of respiration must exist with those appearances stated to be produced by the causes in question, in order that a decisive judgment that death has arisen from them may be formed.

When the lungs show evidences of death from suffocation produced by other means than those just designated, however great may be the turgidity and lividness of the head, or the engorgement in the organs themselves and in the venous system in general, it must not be concluded that it has been intentionally produced, unless the body present clear traces of the use of criminal means qualified to effect it. The signs of

death from the various means of effecting suffocation have been already described, (§ *xii.*) the relation of the criminal means to them will be considered hereafter, when our views are again directed to the evidence furnished by the body externally.

It appears then, that, excepting the cases of drowning and extinction of life by means of deleterious gases, the lungs will in no instance present in themselves evidence of the production of death by criminal measures; nevertheless, the evidence they supply may be of the highest importance in the greater proportion of cases; as, in many instances where death has arisen from *omission of proper care* of the infant, that evidence may be essentially necessary, in order to prove the fact just stated: for examples, when the body has been found exposed in a highway, or hidden in a retired place, or left on the spot where it was born, and death has arisen expressly from such exposure and neglect of it. The same evidence will also be of very great value, in many instances, when connected with that derived from other sources: the relations of which shall now be taken into consideration.

*Value and utility  
of the inferences  
from the state of  
the lungs.*

§ XV. The evidence from the state of the lungs will, in certain cases, present the only means by which a judgment can be formed whether or not certain kinds of destructive vio-

APPLICATION  
OF THE INFE-  
RENCES FROM  
THE STATE OF  
THE LUNGS TO  
THAT DE-  
RIVED FROM  
OTHER  
SOURCES.

lence has been intentionally effected. The following case is clearly in point, and is such as may not very rarely occur.

*In the case of  
luxation of the  
cervical vertebræ.*

The child presents with its feet or breech, in a woman undergoing labour alone ; on the delivery of the body, the head being yet retained, the mother uses efforts to complete the delivery by pulling at the body, and thus produces a dislocation of the cervical vertebræ, or a contortion of them sufficient to cause death by the injury thus effected on the spinal marrow. Here the destructive injury will shew signs of its having been made during life ; but the absence of those of respiration, will point out the probability of its having happened in the way just described, and the signs of the foot or breech presentation (page 24), will enable us to form a satisfactory judgment of the nature of the case.

But, when we find such an injury in the neck, evidently inflicted during life, joined to signs of respiration having been performed, there need be but little hesitation in forming a judgment that it has been intentionally and criminally committed. Because, the existence of respiration proves that it must have been effected either after the child was born, or after the head had been expelled from the vagina of the mother, and had presented at the birth ; in neither of which cases is such an injury likely to happen from natural causes.

*In the case of  
presentation of  
the feet or breech.*

In the case of presentation of the feet or breech at the birth, one child in about four or five is

born dead, (apparently from premature cessation of the circulation through the navel-string,) under the most favourable circumstances of professional assistance ; and, of course, death is likely to happen in a much greater proportion of cases when the mother is unassisted, and especially if she be a very young woman. Here the head and face of the child often present a livid and tumid appearance ; and there may be a livid circle about the neck, made by the orifice of the uterus or the vagina. The absence of the signs of respiration will here prevent the criminative decision that an ignorant and superficial observer may be prompted to form on this occasion.

Another case where there are marks of violence from natural causes exerted during the birth, that, on an imperfect examination, might appear to have been intentionally produced, is where the head exceeds in volume the ordinary ratio to the area of the apertures of the pelvis and the soft parts of the mother through which it must pass during the birth. Here such injury may be effected on the head as will suspend or utterly destroy the life of the child before it is born. In this case, respiration will not have been effected, except in one case, of very rare occurrence, that of respiration when the mouth has presented to the dilated orifice of the uterus, (§ ix. page 45 ;) and this is the only circumstance which places any difficulties in the way of our decision. It, however, commonly happens, that

*In the case of excessive relative volume of the head.*

the appearances of this natural injury are clearly marked (page 24), and may be distinguished from wilful and criminal violence.

The forceps and other instruments, used in cases of difficult labour, may leave traces of considerable injury; and the possibility of their having been employed should not be forgotten on such an occasion.

*From wounds  
and contusions.*

Wounds and contusions qualified to produce death commonly present in themselves the signs by which it may be known that they have been inflicted during life, (§ vi. page 20 ;) the characters of which the practitioner will perceive to be worthy of the most attentive study, when he considers that malicious persons may effect them on the body of a child that has lived after its birth, and died from natural causes, for the purpose of criminating the mother or other persons. Cases of this kind have occurred. No wounds or contusions whatever can, therefore, be believed to have been destructive of life, unless they were both qualified to effect this, and present the characters proper to such injuries occurring in the living body.

To form a correct judgment whether or not a wound or contusion was qualified to cause death *necessarily*, or whether it became mortal in consequence of some peculiarity in the constitution of the subject, is often one of the most difficult points in medical jurisprudence. But these

difficulties do not intrude on our present views ; because injuries of this kind are never wilfully inflicted on a living new-born child, but with the *intention to murder it*. It is only necessary then to state, on the present occasion, that wounds or contusions intentionally and criminally committed, and which have injured the brain, spinal marrow, heart, or respiratory organs, in such a manner as to destroy their vital functions ; or such as have caused such lesion of blood-vessels as to produce mortal hemorrhage, or such as have suspended or prevented the execution of the digestive functions of the stomach and small intestines, or have prevented the entrance of food into the alimentary canal, or the evacuation of the excrementary feces and urine ; must here be regarded as the means of murder.

It is not necessary that signs of respiration be present at the same time with such injuries, in order that the judgment above mentioned may be formed ; because, in the first place, a child may live for some time after its birth, and ordinarily does live for a minute or two before respiration is performed, during which interval the injuries in question, as well as submersion in water, may have been committed ; and, secondly, because they may have been committed when the feet or breech presented at the birth, before the delivery of the head, on various parts of the body. That a child may live long enough, too, for considerable changes in the body to take

place after the receipt of them, without breathing, is rendered very probable by several circumstances; especially the fact of a child living and moving its limbs for several minutes after it has been expelled from the mother, entirely enveloped in the membranes constituting the ovum.\*

*From strangulation.*

Strangulation, effected either by suspension of the body by a cord round the neck,† firm constriction of this part without suspension, (§ vi. page 27), or closure of the orifices of the mouth and nostrils, or of the respiratory channel in any way, produces death by suffocation; the signs of which, presented by the body internally, have been already discussed (pages 27, and 56). It has, too, been already stated, that suffocation from various natural causes will present similar appearances. Suffocation, however, from these causes, ordinarily happens either before respiration has been well established, or from some disease of the respiratory organs evident to the senses. When, therefore, with the signs of suffocation, there are those of perfect respiration, vacuity of the blad-

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\* The most remarkable instances of which on record, that occur to my recollection, are two related by Wrisberg. In one instance, the infant lived seven minutes thus enclosed in its membranes; in the other, nine minutes. Separating the external membrane, he observed them through the internal one. They were curved forwards, and immersed to half the depth of the body in the fluid of the amnios; moved their arms and legs, the former in a direction from the face to the chest; the latter were alternately a little elongated and retracted. The mouth was closed, and no movement of the thorax or abdomen could be discerned. Fearing that the gratification of his curiosity any longer might be criminal, he now ruptured the membranes.

† It was at one time supposed that death took place from apoplexy in this case; but some well-conducted experiments have proved that it is from suffocation. A dog will live for a long time, (for many hours,) thus suspended, if an opening be made through the skin into the cavity of the trachea; whilst one in which such an operation has not been performed, will die in a few minutes.

der and large intestines from evacuation of their contents, when the head has presented at the birth; evidence of the process about the navel towards the separation of the remaining portion of the navel-string, or greater or less obliteration of the channels peculiar to the fetal circulation; and, with all these, there is no apparent disease of the respiratory organs from natural causes; there are grounds for a very strong presumption that death has been criminally produced by strangulation, although we may not be able to discern traces of the means that may have been used. Still, this presumption is only conjectural; the evidence falls short of *positive* proof. This axiom must always direct the judgment of the medical practitioner in enquiries of this kind; *positive inferences of the existence of things must be drawn only from perceptions of them by the senses*: in the case in question, he has perceived no sensible evidences of the use of wilful criminal violence; the negative argument, then, that he cannot explain the occurrence of death in any other way than by the supposition that such violence has been employed, will only admit of the presumption above mentioned.

§ XVI. When, from certain morbid appearances of the stomach or other part of the alimentary canal, or the nature of its contents, suspicions arise that death may have been produced by poison, it will be requisite to resort to the

DEATH BY  
POISON.

proper means for ascertaining whether or not such has been the case. On this point, I find it necessary to refer the reader who is not well informed on this subject to another source ; and, as the best, to the *Toxicology* of ORFILA.\* It would require a very considerable extent of space to treat of it with sufficient precision, and must, properly, form the subject of a distinct dissertation in relation to Medical Jurisprudence. I dispense with the consideration of this subject with the less regret, from its relating to a mean but very rarely resorted to for the destruction of new-born children. Researches of this kind, as well as the anatomical examination, should always be made in the presence of the Jury ; and when any portions of the body, or of its contents, are set apart for a future examination, they should be made secure from the intrusion of any person during the interval, and in such a manner that the parties concerned, that is to say, the Jury and the Medical Practitioner, may know whether or not this guard has been violated, when they recur to their examination.

DEATH FROM  
BURNING THE  
BODY.

§ XVII. Something should be said respecting the destruction of a child by burning it to a greater or less extent ; as the Medical Practitioner may be required to state his opinion, from

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† *Traite des Poisons*, &c. vol. II. 8vo. Paris, 1818. There is extant an English translation of this work.

the evidence in the remaining portion of the body, whether or not the destruction was commenced during the life of the subject. When there is a bright redness of the skin, with some degree of tumefaction of the flesh depending on inordinate afflux of blood, immediately surrounding the burned part, it may be known to have been committed during life. Elevations of the cuticle, with a watery fluid beneath them and above the surface of the skin, commonly called *blisters*, in many instances also surround it, and likewise constitute a positive sign of its infliction during life. The state of the lungs may furnish useful evidence; but this can be of merely secondary importance, as it can, at best, prove no more than that the child had lived after its birth.

§ XVIII. The principal circumstances respecting the death of the child from want of proper and necessary care, have been indicated in several parts of the foregoing sections, as far as regards the infant itself; but, it will often happen, that a decisive judgment on the way in which death occurred cannot be pronounced. When a child of the full term of intra-uterine life, well constructed, presenting signs of the existence of life after birth, is found dead in a situation that must, necessarily, prove fatal to the life of such a child left exposed in it, and there exist no signs of destructive violence qualified to produce its death, there are grounds for a presumptive deci-

DEATH BY  
OMISSION OF  
DUE CARE.

*In the case of  
exposition of the  
body.*

sion that death has arisen from such exposure and neglect. In some cases it cannot be determined whether or not the child had died a natural death previous to this exposition; but, in others, there are means for deciding this question. The way in which the body was clothed; the state of the navel-string, whether or not it was tied, or separated from the placenta; the presence or absence of food in the stomach; marks on the ground about it of its having struggled; and many of the rest of the circumstances pointed out as objects for the attention of the Medical Practitioner in a former part of this dissertation (§ ii), fall especially under the consideration of the Jury. In other cases, things may have been observed which are rather referred to his judgment. As, when it happens that the feces are found evacuated from it on the spot, or blood collected about it, which has evidently issued from the divided navel-string, or when there has been suction of mud into its mouth or nostrils.

*When not exposed or concealed.*

*Necessary succours for new-born children.*

A child which has not been exposed in a public way, or concealed in a retired place, may appear to have died from want of the care and succours which new-born infants require, and without which they will generally die, which are as follows:—1st. The removal of them from the state of supination in which they generally lie on their expulsion from the vagina of the mother. 2d. The preservation about them of a degree of heat nearly equal to that of the medium they have

just quitted. 3d. A supply of proper food. 4th. The division of the navel-string, and the application of a ligature to it. The want of those of the second and third classes, to a certain extent, are necessarily mortal. The first and fourth become so under certain circumstances.

*Necessary succours for newborn children.*

Infants are generally born with the face turned towards the sacrum of the mother, and remain lying on their belly, if the woman has been delivered in the horizontal position. Here, HUNTER remarks, “a strong child may be born perfectly alive, and die in a very few minutes for want of breath; either by being upon its face in a pool made by the natural discharges, or upon wet clothes; or by the wet things over it collapsing and excluding air, or drawn close to its mouth and nose by the suction of breathing.” This fact he illustrates by the following case. “A lady, at a pretty distant quarter of the town, was taken with labour-pains in the night-time. Her nurse, who slept in the house, and her servants, were called up, and I was sent for. Her labour proved hasty, and the child was born before my arrival. The child cried instantly, and she felt it moving strongly. Expecting every moment to see me come into her bed-chamber, and being afraid that the child might be somehow injured, if an unskilful person should take upon her the office of a midwife on the occasion, she would not permit the nurse to touch the child, but kept herself in a very fatiguing posture, that the child

*Necessary succours for newborn children.*

might not be pressed upon or smothered. I found it lying on its face in a pool which was made by the discharges ; and so completely dead, that all my endeavours to rouse it to life proved vain." This fact is of much importance on this occasion ; but the case is one that is not likely to happen often : it is for the Jury to determine whether the conduct of the mother, in a similar one, has arisen from malice, or from erroneous prejudice.

An infant may lose its life in the same way by the state of the mother, when delivered alone, rendering her unable to remove it from such a situation. The most common of such states are, mental alienation ; a certain degree of faintness, or complete syncope ; various states of coma or stupor, apoplexy, and epilepsy : instances of which occurring at the time of the expulsion of the fetus, are related by almost every writer on the obstetric art whose observations are drawn from extensive experience. Such states as those just mentioned, or the prejudices of the woman whose case is related by HUNTER, are the only circumstances which can excuse the leaving the infant in the situation in question, because the natural instinct of the mother leads her to take up her child and to foster it with proper care, when alone ; or, when assisted, to submit, in this instance, to the aid and advice of her attendants. The Medical Practitioner may in certain cases be able to derive some degree of presumptive evidence of the occurrence of such states, from sub-

sequent examination of the mother; and he may thus furnish the jury with more or less solid grounds for the establishment of their verdict, in cases where such a plea is set up by the delinquent; but this is a point which much more frequently rests on the basis of moral evidence alone, as existing in various circumstances connected with the conduct of the delinquent before, and subsequently to, her delivery. This should, however, be impressed on the minds of the Jury,—that it is possible for a woman to be with child without her supposing that she is in this state.\* The circumstance of an unmarried woman undergoing labour alone, in the midst of civilized society, and of not having prepared linen, &c. for her infant, are generally regarded as unfavourable to her. It is for the Medical Practitioner to state, that, supposing her to be conscious of her pregnancy, she may have miscalculated the epoch of her delivery: the other moral circumstances of the case appertain to the Jury.

*Necessary succours for newborn children:*

Estimable authors on the obstetric art have stated, that an infant may die from suffocation, if it lie on its back for some time after its delivery, apparently from the glairy mucus collected about the fauces getting into the trachea. The remarks

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\* Besides the common ignorance of young girls on this subject, it may be worthy of remark, that there is very prevalent amongst women the notion that the occurrence of any thing like a *menstrual evacuation* shows, certainly, that they are not with child. Nothing is better proved than that such a discharge does appear in some women throughout the whole of their pregnancy. The source of such a discharge is not a subject for discussion in this place.

*Necessary succours for new-born children.*

made on the former case are equally applicable to the latter.

No general rules can be adduced respecting the second proposition ; every intelligent person must be able to form a correct decision on facts respecting the want of the measures relative to it.

The third mean of death from neglect,—that from want of food, is not likely to occur, except with exposure of the body ; as the cries of the child from hunger would disclose the practice to the neighbours of the delinquents, were it resorted to in the midst of society.

It should be borne in mind, that, unless seven months of fetal life have been exceeded, the probable inference is, that, although respiration may be established after birth, the subject will soon cease to live, notwithstanding every proper care. The cases in which infants have been preserved alive for a considerable time, that had not arrived beyond the term of six months and two weeks of fetal life, are very rare. This fact, too, should never be lost sight of,—that a great proportion of infants die soon after their birth, in spite of all the attentions that natural instinct and medical precepts inculcate as best calculated to preserve their life.

The proposition respecting the division of the navel-string, and the application of a ligature to

the infantine portion of it, involves three or four difficulties; which consist in the following cases. *Necessary succours for newborn children.*

1°. The infant may perish during its birth, from hemorrhage from the placenta or rupture of the navel-string, and the mother may or may not have divided the latter; 2°. The child may have lived after its birth, and the mother may have torn or cut asunder the navel-string, and, finding no hemorrhage ensue, she has not been led to put a ligature on the infantine portion, and afterwards hemorrhage has taken place from it, from which the infant has died;\* 3°. The mother may discover the hemorrhage in the last-mentioned case, and may apply a ligature to the navel-string, but too late to preserve the infant's life; 4°. The blood of the mother may be artfully placed about the child, and the navel-string left untied; and the mother may wish to have it appear that the infant perished from hemorrhage occurring unknown to her, and that she was not aware of the necessity of tying the navel-string, even though it be found that she has *cut* it, not *torn it asunder* with her hands.† In the first

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\* The following case lately occurred to a medical practitioner of my acquaintance: The navel-string of a living infant was tied in the usual way, but by accident the funis separated very close to the ligature. Two hours afterwards he was sent for, and, on his arrival, he found the infant on the point of dying from hemorrhage, that had just occurred from the navel-string. The infant had been washed and dressed in the usual way, and had not cried after it had been placed in bed with the mother, soon after which the hemorrhage was discovered. The child was, fortunately, preserved, by very assiduous subsequent care. It should, however, be borne in mind, that hemorrhage of this kind is very unlikely to occur when the navel-string is torn asunder with the hands. [See the ensuing note.]

† The division of the navel-string by an instrument may properly give rise to a strong presumption that the mother is acquainted with the practice of civilized persons in this point, and therefore that she knew that a ligature should be applied to it: besides, the division of the navel-string in this way is almost always instantly followed

three cases, there will be present the signs of such hemorrhage, as described in a former part of this dissertation, (page 31) : in the last case, the proper fulness of the blood-vessels and heart with blood, will show the imposture. It is impossible to trace any rules of general application respecting the first three cases. The decision must be partially founded on various collateral moral circumstances, which come especially within the province of the Jury ; and are, therefore, not proper for further discussion in the present dissertation, as the judgment must be regulated by the common rules of moral and presumptive evidence.

In the case of infants being found in privies, and the like places, it should be understood that an infant, even at the full term of utero-gestation, may escape from a woman, who has borne one or more children, during her exertions to evacuate the contents of the intestines ; many instances of which are related by estimable authors, on grounds which cannot be disputed.

THE DETER-  
MINING OF  
THE RELATI-  
ONS OF THE  
INFANT TO  
THE SUPPOSED  
MOTHER.

§ XIX. In order to attain the fifth object of this inquiry, (§ v.) it is in the first instance ne-

---

by some degree of hemorrhage from the infantine portion of it ; in which case there can be no doubt but that the mother's instinct would lead her to grasp it, and look about for something to tie it with, in order to staunch her infant's flowing blood. The natural instinct of the mother leads her, when she hears the child cry, or finds it is delivered, to take it up and tear asunder the navel-string with *both her hands* ; by this means it must be torn at the distance of more than a hand's breadth from the navel : in this case hemorrhage from the cord will hardly ever take place.

cessary to form a decision respecting the length of time that has elapsed since the birth of the child. It will be necessary to consider here the period which the infant may have lived, and that which has passed since its death. The state of the navel is, in general, the best mean for determining the former point. The umbilical cord separates from the navel ordinarily about the fifth day, and is almost always partially detached on the fourth; the ulcerated surface is commonly healed by the eighth or ninth day. These two circumstances, and the degree of the process towards them, will enable us to determine this part of the question with sufficient precision in the generality of cases. The state of the lungs, the canalis arteriosus, and umbilical vessels, will also furnish additional useful evidence, on the grounds which have been designated in several parts of this dissertation. The other point is often one of great difficulty, as the changes which take place in the body after death are so considerably modified by numerous external circumstances: thus, putrefaction takes place more rapidly in summer than in winter, during a southern wind and in a moist situation, than when the place is dry and the wind northerly. It putrefies quickly in stagnant water exposed to the rays of the sun; but, in a running stream, and in a cold season, it is often preserved without sensible decomposition for a long time, and is sometimes converted into *adipocire*, (page 16.) It is also preserved apparently fresh

for a long period, in a marlous or argillaceous soil ; and, as it would appear from some observations, in *cloacas*, developing an abundance of gases. A body exposed in the open air in a dry and cold winter, will be preserved without much evident decomposition for many weeks. But, though the body may be preserved apparently fresh for a long time in a dry and cold wind, a shrivelled and dried state of it, especially of the globe of the eye, and the tendons of the muscles, will often clearly indicate, to an accurate observer, that it has been long exposed in this way.

The value of the determination of the above matters, consists in the application of the evidence in question to the period which has apparently elapsed since the delivery of the suspected mother. The Medical Practitioner is generally required to examine the mother, and give his opinion on this point, even though it may be known with moral certainty, from various circumstances in her conduct.

*Signs of recent  
delivery.*

The more strongly-marked and characteristic signs of recent delivery at or near the full term of utero-gestation, and before above three or four days have elapsed since its occurrence, are, a slight paleness of the face ; the eye is a little sunken, and surrounded by a purplish or dark-brown coloured ring. The pulse is full and undulating ; the skin soft, supple, rather warmer than ordinary, and covered with a moisture having a peculiar and somewhat acid odour.

The breasts are tumid, and on pressure emit a lactiform fluid. There is a dark areola round the nipples; the belly is soft; the skin of the abdomen is lax, lies in folds, and is traversed in various directions with shining reddish and whitish lines, and which especially extend from the groins and the pubis towards the navel. A line of a brownish colour commonly extends from the centre of the pubis to the navel; and, when the point of the finger is run along this, a separation of the muscular fibres parallel to the median line is evident, and which is broadest towards the navel. The uterus may be felt through the abdominal parietes, voluminous, firm, globular, rising very near as high as the umbilicus, contracting and expanding under the hand on pressure. A discharge of serous fluids mingled with blood, of a peculiar acid odour, takes place from the vagina, and this fluid often contains small clots of blood. The external genital organs, that is to say, the labia pudendi and vagina, are tumefied, and dilated throughout the whole of their extent; the orifice of the uterus is soft, supple, and considerably dilated. Sometimes the anterior margin of the perineum is a little torn, or it is lax, and appears to have suffered considerable distension. Professor CHAUSSIER states, that no disease or affection besides parturition can produce the whole series of signs just described. After the fourth or fifth day, they become considerably less evident; and, at the end of seven or eight days, but few of them can be observed.

*Signs of recent delivery.*

*Signs of recent  
delivery.*

The secretion of milk may continue ; but Professor JOHN BURNS, (who is here quoted, as the latest good author on this subject,) says “ it is possible for this secretion to take place independently of pregnancy.” \*

It may happen that the Practitioner will be required to form an analogous judgment from examination of the dead body of the mother ; the appearances generally observable on this occasion are thus described by Professor BURNS.†

“ If the woman die of hemorrhage, or from any cause destroying her, soon after delivery, the uterus is found like a large flattened pouch, from nine to twelve inches long. The cavity contains coagula or a bloody fluid, and its surface is covered by the remains of the decidua. Often the marks of the attachment of the placenta are very visible. This part is of a dark colour ; so that the uterus is thought to be gangrenous by those who are not aware of the circumstance. The surface being cleaned, the sound substance of the womb is seen. The vessels are extremely large and numerous. The fallopian tubes, round ligaments, and surface of the ovaria, are so vascular, that they have a purple colour. The spot where the ovum escaped, is more vascular than the rest of the ovarian surface. This state of the uterine appendages continues until the womb has returned to its unimpregnated state.

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\* *Principles of Midwifery*; page 451, fourth edition.

† *Op. cit.* p. 452.

“A week after delivery, the womb is as large as two fists. At the end of a fortnight, it will be found about six inches long, generally lying obliquely to one side. The inner surface is still bloody, and covered partially with a pulpy substance like decidua. The muscularity is distinct, and the orbicular direction of the fibres round the orifice of the tubes very evident. The substance is whitish. The intestines have not yet assumed the same order as usual; but the distended coecum is often more prominent than the rest.

*Signs of recent delivery.*

“It is a month at least before the uterus returns to its natural state, but the os uteri rarely, if ever, closes to the same degree as in the virgin state.”

The consideration of the appearances just described, may become a matter of serious importance on another occasion, besides that just indicated, as when a woman is suspected of having produced a child which cannot be found; for, though the coroner cannot take an inquest in this case, (as it can be done only *super visum corporis*,) the affair may be enquired into by the justices of the peace, and brought into a court of criminal judicature.

§ XX. The Medical Practitioner has now only to present his formal report, containing his conclusions in respect to the stated objects of this

REPORT OF  
THE MEDICAL PRACTITIONER  
TO THE LEGAL  
AUTHORITIES.

REPORT OF  
THE MEDICAL  
PRACTITION-  
ER.

inquiry, (§ v.) in order that his duties may be completely fulfilled on this occasion; and, when he has proceeded in the manner indicated in this dissertation, he will have arrived so near to the requisite conclusions, that but little further reflection will be necessary to enable him to form his judgments in a satisfactory manner. The order of his notes, too, is that which is proper for him to adopt in the construction of his report.

After having concisely related the time and the circumstances under which he was required to visit the body, and the observations he may have made in conformity to the directions given in the second and third sections, he will state the results of the several series of researches described in each distinct section of this dissertation, as far as the subjects of them have been observed or examined. When wounds or other consequences of violence are present, he should describe, particularly, their characters, and the mode in which the body has been interested by them; and this should be done in the manner of a simple demonstration. His rational inferences should follow the complete exposition of the evidence whence they are drawn. His judgments should be advanced in the most precise and simple manner. He should not enter into any arguments or apologies for his opinions; neither should he attempt to give additional weight to them by adducing those of any writer on the subject, as the propriety of the application of

these to the case in question will not be recognized by the Court. He is supposed by the legal authorities to be sufficiently acquainted with the known physiological laws which relate to the subject under consideration, and it is his own interpretation of what he has observed that is here required.

§ XXI. It was stated at the commencement of this dissertation, that the destruction of the life of a child during the period of its existence, regarded in the foregoing views, was not in itself contemplated distinctly from *homicide* at any other epoch of life by the law of England, which attaches the penalty of death to this crime. But some statutes have been enacted, at different times, respecting the commission of this crime under certain circumstances, as, where the subject is born a bastard; and it would, indeed, appear that the legislature has not considered it probable that such a crime could be perpetrated, at least by the mother, in any other case than that just mentioned; for it is to that alone all the peculiar provisions on this subject expressly relate.

LAWS AND  
LEGISLATIVE  
ENACTMENTS  
RESPECTING  
INFANTICIDE.

The murder of bastard children by the mother was considered as a crime so difficult to be proved a century or two since, when physiological knowledge was in a very rude state, that a special legislative provision was made for its prevention, by a statute passed in the reign of James the First, (12. c. 27,) which required

*Laws of England  
and Ireland.*

*Laws of England  
and Ireland.*

that any such mother endeavouring to conceal the death of the child, should prove, by one witness at least, that the child was actually born dead. This severe law, which made the concealment of the death almost conclusive evidence of the child's being murdered, was repealed, together with an Irish Act upon the same subject, by a late statute,\* which provides, "that the trials in England and Ireland, respectively, of women charged with the murder of any issue of their bodies, male or female, which, being born alive, would by law be bastard, shall proceed and be governed by such and the like rules of evidence, and of presumption, as are by law used and allowed to take place in respect to other trials for murder, and as if the said two several Acts had never been made." The statute further provides, that the Jury, if they acquit the prisoner of murder, may find that she was delivered of a bastard child, and endeavoured to conceal the birth, whereon the Court may adjudge her to be committed to prison for any time not exceeding two years.

The actual perpetration of destructive violence is not absolutely necessary in order to constitute this crime, any more than it is in respect to homicide under certain other circumstances: for, if the mother omit such care and aid as would be necessary to sustain the life of the infant, or expose the infant, or place it in such a situation,

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\* 43d Geo. III. c. 58. § 3.

as that death occurs in consequence of such act, or of such want of aid and care; it would be murder by the common law, if a Jury were satisfied that the mother contemplated, or could not in nature and reason but have contemplated, the consequences which must have resulted from her act.

By the law of Scotland, the penalty of death is attached to the crime of Infanticide; and, in former times, this penalty might be put in force on merely presumptive evidence, for the statute of 1690 (c. 21.) enacts, that “any woman who shall conceal her being with child during the whole time of her pregnancy, and shall not call for, or make use of, help in the birth, is to be reputed the murderer, if the child be found dead or amissing.”

*Laws of Scotland.*

The latest conviction on this statute occurred in the year 1776. Since then, until the enactment of a recent one, in cases where the charge had been upon the *statute only*, and which have otherwise been favourable to the delinquent, it had been common for the prosecutor to consent to the delinquent's petition, praying to be banished forth of Scotland, or for other arbitrary punishment. To correct this as it was deemed too lenient course of practice, and yet avoid recurring to the rigour of the Act of 1690, it has more lately been thought advisable to repeal that statute, and to substitute in its stead a qua-

lified and more temperate enactment; under which, if a woman “shall conceal her being with child during the whole period of her pregnancy, and shall not call for, or make use of, help or assistance in the birth; and, if the child shall be found dead or amissing, the mother, being lawfully convicted thereof, shall be imprisoned for a term not exceeding two years.”\*

The fundamental circumstances required by the above statute for the attachment of the penalty it enacts, are, that the woman be proved to have been pregnant, and that the child be missing, or that the dead body of a child be found, which is proved to be her child. In the former case, the proof of the pregnancy can only be by those signs in the state of the woman's person which show her to have been recently delivered. The statute has presumed, that decisive evidence of pregnancy may in this way be obtained, else it could not have ordered any thing in the case of a child that is missing; and that, where the birth is a mere abortion, or when criminal violence has not been inflicted on it, it will not be concealed. In the case of the body being found, the above-mentioned evidence may be strengthened, if the woman, on being shown the body, has admitted it to be that of her child; which confession, of itself, has always been held sufficient proof of that material fact against her.

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\* 9 Geo. III. c. 14.

DAVID HUME, in his Commentaries on this statute, remarks, that it is clear, from the expressions and context, that it is not necessary to prove that the child was born at the full time, or that it was born living, in order that the penalty of it may be put in force; because, neither of these circumstances can be determined in the case of the child being missing. But, in case of a child being found, those circumstances become of serious importance in regard to the new statute, where imprisonment is the only punishment for the delinquency alluded to in the statute in question.

The crime of simple *exposure* of infant children is punished by an arbitrary penalty which does not materially differ from that attached to it by the English statute-law under similar circumstances; the nature of the delinquency being contemplated in the same manner by the legal institutes, and similar rules of moral and presumptive evidence directing the juridical verdict, in both nations.

FINIS.



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